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MUNICIPAL STREET LIGHTING CONTRACTS.

Among the problems of central station work which involve close appreciation of both technical and commercial elements for the largest success and most lasting satisfaction between a company and its customers the modern street lighting contract takes a prominent place. The taxpayer realizes that the cost of street lighting is a direct charge, and while he may be a power consumer in his private business, it is easy for him to look upon street lighting costs as sheer outgo, in comparison with the definite results which he obtains on his own premises for a given expenditure devoted to lighting or motor service. The approach of a renewal time in a street lighting contract is only too often the signal for unfair attempts on the part of the politicians to scale down the charges for service, and as everybody is interested in the quality and amount of illumination provided in the thoroughfares of a city buying central station current, it is easy to stir up public opinion on the rate question. A most important part of the central station manager's work is therefore the study of street lighting conditions in other communities, in order to meet unfair attempts to secure reductions by definite explanations of differences in local conditions that justify differences in rates or service, and to provide on the other hand the best service that is available in the art.

The form of street lighting contract desirable will naturally vary widely in different cities and towns, but in general the more definite the contract as to the service to be rendered, the price to be charged, the privileges of the two parties, and the inclusion of possible new conditions, the less opportunity there will be for future disagreement.

A well-drawn contract will, it would appear, state definitely the extent of service and its duration, with the course to be followed in case a named maximum number of lights are desired to be exceeded by the city. It is desirable from the city's standpoint to state in the contract that the price named covers the service, the company being required to bear the cost of generating the current, and as a rule paying for the supplying and maintenance of all lamps, poles, wires and attachments. The rating of the lights is obviously one of the most vital points to define, and all hazy specifications should be avoided on this point. Thus, in a recent contract the lighting unit is specified as of "not less than two thousand nominal candle-power, and as long as the present type of alternating-current lamps are used the current supplied shall be not less than seven and one-half amperes intensity, and the apparent watts shall be not less than 540 at the lamp." This particular specification wisely brings the lamp size down to accurately and easily measurable quanti-

ties, and still provides for future improvement in the art. Too close a specification on a single point tends to prevent the municipality from enjoying the advantages of progress in equipment manufacture, as in the case of an eastern city which required the company to supply incandescent lamps of a certain wattage each, regardless of their candle-power.

The privilege of installing testing instruments, either of the indicating or recording type, is sometimes allowed the municipality, and it is not considered unfair to the company to require recording ammeter charts showing the hours of service and the outages to be submitted with each bill. Either party may rightfully demand the recalibration of the recording meter at any time. The place where such meters may be installed, and the reduction allowed on outages should also be stated. In one recent contract of this character the bill is reduced two cents per hour per lamp for each ampere or fraction thereof that the current falls below 7.5 amperes, up to a total of four cents per lamp per hour. Right to use the public thoroughfares for construction of street lighting equipment and its maintenance may properly be incorporated in the contract, to save time and formality in regard to permits when work is to be done. No charge should be made by the municipality to the company for any pole or fixture work under the duties of the street lighting service.

Unless the terms of lighting and extinguishment are positively and definitely set forth in such a way that no possible misunderstanding can arise, the contract is faulty. If any lighting schedule or table is referred to it should either be included in the contract text or attached as an included supplement. Another wise provision is to specify the heights permissible for lamp suspension, the quality of fittings desired and the conditions under which tree trimming may take place. Continuous service is so essential to this class of work that generally a brief statement to the effect that the company shall maintain a patrol system and emergency force required to handle outages or defects at the earliest feasible moment on report from police officers or individuals is all that is needed. In some cases it is desirable for the company to furnish the city a map, showing the location of all poles, wires and lamps used in the arc service, filing a new and corrected map at the office of the city engineer whenever a change of any consequence is made. A fair appreciation of mutual conditions will do much to create good feeling and avoid disagreements. The right of the city to install and maintain fire-alarm and other municipal signaling wires on the lighting poles for street service is frequently considered fair by central stations. The day of the month upon which payments are due from the city may properly be included. If at any time the city desires new types of equipment for use in its street lighting service, the contract ought to provide the course to be followed in conference with the company, together with provision for appeal to an arbitrating authority in case of disagreement. The central station can request the inclusion of a provision for the extension of the contract for given period if it desires, without going to the trouble of rewriting the contract in detail.

ELECTRIC POWER IN SOUTHERN MILLS.

Cotton mills in the South are rapidly abandoning steam plants in favor of power from the hydroelectric companies. One of the hydroelectric systems in the Piedmont region of North and South Carolina, where the majority of the southern cotton mills are located, is now operating more than seventy of these mill plants, and most of the mills have been connected to its lines within the past two years.

As a rule, these cotton mills operate about 3,300 hours per year, when there is enough business, and electric power is usually sold to them at so much per kilowatt-hour, recorded by a meter, so that the only payment by a mill is for energy received.

Rates vary, but eight-tenth cent per kilowatt-hour, or about $26 per kilowatt for an operating year of 3,300 hours, is a common rate, while some mills do better than this. Lower rates are made to mills that own substations and receive their energy at the voltage of transmission than to mills that are supplied with current at motor voltages by the hydroelectric companies.

Formerly most of the motors in cotton mills were operated at about 550 volts, and substations were designed to distribute current at this voltage. As this practice tended too much to the multiplication of small substations, of less than 1,000 and even less than 500 kilowatts capacity each, with a high cost per kilowatt, the hydroelectric companies have offered some inducements in rates to mills taking current at about 2,000 volts, and many mills now operate motors at this voltage. Where a mill operates with individual motors of twenty-five-horse-power or less for its looms, it is often necessary to step down the 2,000-volt current to 550 volts.

Most, if not all, of the electric power supplied to cotton mills in the Piedmont region is three-phase at sixty cycles. The choice of sixty cycles by the hydroelectric companies appears to have been mainly influenced by the fact that mills using electric drive from local power plants, when the electric companies came into the field, were mostly equipped with sixty-cycle motors, that the power demands of the cotton mills were much greater than any railway loads in prospect, and that generators, transformers and motors are cheaper for sixty than for twenty-five cycles.

Cotton-mill loads are remarkably constant during the hours of each day when in operation, so that a large generating station driving dozens of these mills on a long transmission line shows a variation of less than ten per cent in load from 6 A. M. to 6 P. M., except at the noon hour. For this kind of load the highest points appear to be reached at about 9 A. M. and 3 P. M. The consumption of electric energy from day to day is also very uniform in cotton mills, the variation being usually less than ten per cent, except on Saturday when the hours of operation are less than on other week-days.

Southern cotton mills may be contrasted with those in the North as to the larger number of the former often found in one city or town, and as to their consequent small capacity. The average power required by the southern cotton mill is therefore small.

One of many illustrations on this line may be noted at Con-

cord, N. C., a city of 7,910 people in 1900, where there are ten different cotton mills with a combined equipment of 149,310 spindles, 3,495 looms and electric motors and steam engines of 5,610 horse-power. The average equipment for each of these ten mills is thus 14,931 spindles, 349 looms, and driving apparatus of 561 horse-power. In five of these Concord mills the driving power is taken from the transmission lines of a hydroelectric company.

Records of operation here presented for two southern cotton mills show well the uniform character of their loads, and consequent high-load factors. One of these is a cotton-spinning mill operating sixty-six hours per week, and during one week of normal operation the total consumption of electric energy was 12,650 kilowatt-hours, giving an average load of 191.6 kilowatts. The meter indication of power in use at this mill was taken at about 2 P. M. on two days and was found to be 208 and 210 kilowatts respectively. During twelve months, frequent observations of the meter disclosed a maximum load of about 220 kilowatts at this mill. On this observed maximum the average of 191.6 kilowatts gives a load factor of eighty-seven per cent.

Another cotton mill is supplied with electric current at about 2,000 volts from transformers of 475 kilowatts total capacity, for motors of 445 aggregate horse-power, driving 14,000 spindles and 800 looms. This mill operates sixty-two hours per week, and driving one week of normal operation the energy consumed amounted to 19,050 kilowatt-hours, corresponding to an average load of 307 kilowatts per day. During a period of twelve months the maximum reading of the meter at this mill showed a load of 320 kilowatts, so that the load factor, on the basis of the average of 307 kilowatts noted above, was ninety-six per cent. Another normal week of operation at this last-named mill showed a consumption of 19,650 kilowatt-hours, corresponding to an average load during the hours of operation of 317 kilowatts and to a load factor of ninety-nine per cent. So high a load factor raises a doubt as to the accuracy of the reported maximum load of 320 kilowatts during the entire year, but in any event the load factor is very high. The load factor here considered is, of course, taken for the hours of operation only and not for the entire twenty-four hours of each day.

At the last-named mill the motor capacity of 445 horsepower is the equivalent of 333 kilowatts, and with an efficiency of ninety per cent the power demand with all motors at rated load would be 370 kilowatts. The average load of 317 kilowatts is thus about eighty-five per cent of the demand of all motors at normal load.

Several of the above features of its cotton-mill loads make the South an attractive field for the construction of hydroelectric plants. As the cotton factories are split up into rather small units that require only 500 to 600 horse-power each, on an average, the cost of steam power at each mill must be greater than it is in the larger plants at the North, and this tends to keep up the price of electric power. Besides this, few industries show better load factors than those indicated above.

MACHINERY DATA FOR PURCHASERS.

Whenever an intending purchaser of machinery asks a manufacturer for technical data regarding his product it is more important than is always appreciated to supply information of this character promptly. A well-conducted district office should usually be provided with all the important dimensions of standard apparatus, its capacity under clearly defined conditions of service and its approximate cost for preliminary figuring. Where special machinery must be designed and built or where standard equipment must be somewhat modified in order to effect a sale it is out of the question to expect the manufacturer to supply detailed figures at short notice, but certainly so far as regular products are concerned there is little excuse for delay.

There is no doubt that some prospective purchasers call for data with very little idea of awarding the contract to the company which supplies them, and sometimes even the buyer of apparatus will ask for the most minute details of the equipment-points which do not concern him in the slightest direct way in the matter of operation. In the sale of a new design of electric motor, for instance, a purchaser may call upon the manufacturer to give him a copy of the detailed design, showing the exact cross-sections of the magnetic circuits, the number of turns of wire on each coil, dimensions of commutator bars, bearing surface and many other facts. Whether the manufacturer gives out this sort of information willingly or not, most of it can be determined if the purchaser cares to take the trouble, so there is little reason to hold back such data from bona-fide purchasers. It may be well to request that the information be kept as confidential, and most buyers of machinery are willing to accede to a reasonable request of this sort, but after all, mere possession of the statistics of a machine design far from qualifies the holder to reproduce the actual apparatus. It is entirely proper, however, that the innermost details of a costly machine design should be difficult of access, protected though they may be by patent rights.

It is an actual fact that the failure to furnish such information as the capacity of apparatus, its over-all dimensions, weights, number and size of important parts, areas of working sections, etc., at an early stage of the negotiations with a prospective purchaser may result in serious delay to all parties concerned, and if these data are withheld after the apparatus is installed, considerable inconvenience may result. Particularly when sudden interruptions of service occur is it essential to know the principal technical data of a piece of machinery in order to expedite repairs and the replacement of extra parts that may often have to be ordered by wire. Among the loose ends which remain to be cleared up after a new installation begins service there is nothing of more importance to the purchaser than the possession of sufficient information to enable him to maintain as well as operate the apparatus. A narrow policy in supplying blue prints and other important data on the part of a manufacturer may easily prejudice the purchaser against him in future selections of equipment.

Street Railway Conventions.

Meetings of the American Street and Interurban Railway Association, the Accountants', Engineering, Claim Agents' and Transportation and Traffic Associations, Atlantic City, N. J., October 12-16.

THE annual meetings of the American Street and Interurban Railway Association and its affiliated organizations, the Accountants', Engineering, Claim Agents' and Transportation and Traffic Associations were held at Atlantic City, N. J., October 12 to 16. Sessions were held on the morning and afternoon of each day, and in addition to the exhibit of the Manufacturers' Association there were a number of entertainments which were greatly enjoyed.

On Monday the Atlantic City Business League held a carnival, with a military parade and industrial parade on Atlantic Avenue. In the evening there was a display of fireworks and a musical carnival near the city hall. Later in the evening an informal dance was given in the ballroom of the Marlborough-Blenheim Hotel.

On Tuesday evening the annual reception of the associations was held in the solarium of the Marlborough-Blenheim. The soloists were Miss Margaret Keyes and Oley Speaks.

On Wednesday afternoon the ladies of the associations were entertained at the Country Club of Atlantic City. On Wednesday evening the Manufacturers' amateur vaudeville and theatrical performance was given at the Savoy Theatre.

On Thursday afternoon the ladies of the convention were tendered an entertainment in the solarium of the Marlborough-Blenheim Hotel, Miss Amy Grant giving a series of musical readings. On Thursday evening there were theatre parties at the Apollo and Savoy Theatres.

On Friday evening there was an entertainment in the solarium of the Marlborough-Blenheim.

Headquarters were established for convention registration and other business on Young's million-dollar pier. The American association and Manufacturers' association established hotel headquarters at the Marlborough-Blenheim, the Accountants at the Chalfonte, the Engineering association at the Dennis, the Claim Agents at the Traymore, and the Transportation and Traffic association at the Traymore.

The morning of Monday was given over to the registration of the delegates and guests and to preparation for the technical sessions.

The American Street and Interurban Railway Association.

THE first meeting of the American Street and Interurban Railway Association was called to order at 3 P. M. on Tuesday by Vice-President Shaw, acting as chairman in the absence of President Calvin G. Goodrich. Mr. Shaw read a letter from the president expressing his regret at being unable to be in attendance at the convention.

The report of the executive committee was read and approved.

The secretary's annual report was presented and accepted.

The annual address of President Goodrich was read by Mr. Shaw. It contained several suggestions concerning the future policy of the association. The suggestion that the association appoint separate times and places for holding the annual conventions of certain of the affiliated associations was discussed, and it was considered inadvisable on account of the importance of the subject to take immediate action. A resolution was introduced by W. G. Ross and adopted as follows: "That a discussion be held at Thursday's session with the idea of appointing a committee to study the question, this committee to make a report, which is to be distributed among the members."

The Committee on Badges reported that a badge for associate members had been adopted.

The report of the Committee on Membership was presented, followed by the report of the Committee on Subjects.

The final business of the session was the hearing of the report of the Committee on State and Federal Regulations.

The Wednesday session was called to order by Vice-President Shaw at 2.15 P. M.

The report of the Committee on Education was presented by Professor A. S. Richey, in the absence of the chairman, H. H. Norris. This report described the apprenticeship courses adopted by the New York Central Railroad Company, the Master Mechanics' Association, the Trustees' Gas Educational Fund, and the Edison companies. The results of the apprenticeship work have been very satisfactory, and the report concludes that the example being made by the railway and lighting industries in the training of employés indicates the importance and value of the work. Some form of cadet or apprentice plan seems necessary to the best development of employés, but the plan must be adapted to local conditions.

This report was discussed by Professor D. C. Jackson, who said that but few electric railway corporations had shops and construction organizations of such magnitude as to make it desirable to establish an apprentice course. On the other hand, there are many companies employing large numbers of men who are without advanced technical training. Such companies would find it well worth while to establish courses of training, and it seemed that the extension of the cadet system among the various electric railway companies would lead to an ultimate enlargement of the body of competent and able engineering and executive officers which the companies would have to draw from.

The report was also discussed by C. H. Hile, of the Boston Elevated Railway Company; Howard F. Grant, who described the system employed by Stone & Webster, and L. H. Storrs.

W. Caryl Ely delivered an address on the subject "How Can the American Street and Interurban Railway Association and Its Affiliated Associations Be Made of the Greatest Value to the Member Companies"?

Mr. Ely believes that the different classes of work should be subdivided and committed to the care of various committees, so that ample time could in that way be had for proper investigation.

A communication was presented from the *Electric Railway Journal*, offering to compile and publish, free of any cost to the organization, an electric railway dictionary, and requesting the association to name an editing committee, this committee to be an advisory committee on the publication of the dictionary. This proposition was approved and the following committee appointed by the chairman: H. H. Adams, New York; Paul Winsor, Boston; Richard McCulloch, St. Louis.

The constitution and by-laws of the American Street and Interurban Transportation and Traffic Association were approved, and a communication from the J. G. Brill Company was read, offering a prize to students in the technical schools of the country for the best thesis on city

and interurban cars. It was decided to authorize the incoming president to appoint a judge to act in conjunction with S. M. Curwen and H. W. Blake.

The Thursday session of the American association was called to order by Vice-President Shaw at 2.50 o'clock.

The report of the Committee on Insurance was presented and accepted.

E. G. Connette, chairman of the Committee on Welfare of Employés, presented the report of this committee.

Following the discussion on this report, the report of the Committee on Nominations was presented and accepted as follows: President, James F. Shaw, Boston, Mass.; first vice-president, Arthur W. Brady, Anderson, Ind.; second vice-president, Thomas N. McCarter, Newark, N. J.; third vice-president, Gen. O. H. Harries, Washington, D. C.; fourth vice-president, Charles N. Black, San Francisco, Cal.

The Committee on Resolutions presented a report thanking the Manufacturers' association for bringing together the elaborate collection of railway appliances on exhibition. The report also presented resolutions thanking the mayor of Atlantic City, the Atlantic City Business Men's League, the Atlantic City Hotel Men's Association, the technical and local press, the officers and committees of the association, the committee which had carried out the conferences with the Interstate Commerce Commission on depreciation, and President Goodrich.

Resolutions of regret upon the death of C. Densmore Wyman and John A. Brill were also presented.

The convention of the American association was then adjourned.

The Accountants' Association.

THE twelfth annual meeting of the American Street and Interurban Railway Accountants' Association was called to order at the Chalfonte Hotel at 10 A. M. Wednesday by R. N. Wallis, acting president.

The records of the last meeting were read and approved, and Mr. Wallace delivered the annual address of the president.

Acting Secretary H. E. Weeks read the report of the executive committee, recommending an addition to Section 1 of the by-laws, as follows: "All past-presidents of the American Street and Interurban Railway Accountants' Association and its predecessor, the Street Railway Accountants' Association of America, shall be honorary members of the executive committee without the right to vote."

The appointment of a committee upon inter-line accounts was also recommended.

W. H. Forse, Jr., explained that the Central Electric Accounting Conference, an informal association composed of the accountants of various electric railways in the Central States, had been organized in order that the accountants might get together and discuss matters of mutual interest at more frequent intervals than the meetings of the national association afforded. At a meeting in Indianapolis recently the subject was brought up, and it was suggested that the American association be asked to act in the matter, so that it would be broader in its scope, and not only affect the railways in the Central States, but all the electric railways in the country that are interested in inter-line accounting. It was decided that the chair appoint a committee of five to act on this matter.

The report of the treasurer showed that the expenditures during the fiscal year were $1,794.66. Standard classifications sold during the year amounted to $119.50.

F. W. Sweney, special examiner Interstate Commerce Commission, addressed the meeting, and stated that the commission had issued three classifications which will become effective on January 1. He was satisfied that if there were any points in which the classifications were not clear they could be developed, and that the commission would be glad at any time to receive suggestions with regard to any points which might be disputed.

A. R. Patterson read a paper entitled "Organization of the Accounting Department of an Electric Railway and Light Company."

There was considerable discussion on this subject, and the meeting adjourned after the appointment of nominating and resolution committees.

The Thursday session of the Accountants' association was called to order at 10.20 A. M. Fred G. Simmons, president of the Engineering association, addressed the meeting, and his recommendation for the appointment of a joint committee was referred to the incoming executive committee.

Ellis G. Carpenter, representing the Claim Agents' Association, addressed the convention, followed by William H. Forse, Jr., who presented a paper entitled "Inter-Line Accounting of Interurban Railways."

Mr. Forse was followed by A. F. Weber, statistician for the Public Service Commission for the First District, New York, who made a brief address.

The Friday session of the Accountants was called to order at 10.20 A. M., and the paper by A. B. Bierck, entitled "Effect of Electrification on Accounting Methods of Steam Railways," was read by Acting Secretary Weeks.

Frank R. Henry, who resigned as president of the association during the year because of his resignation from the United Railways Company, of St. Louis, to engage in other business, was elected an honorary member of the association.

The incoming executive committee was directed to take up with the Transportation and Traffic association the desirability of the appointment of a joint committee to consider questions of interest to that organization and the Accountants' association. It was also proposed that similar committees be created with the Claim Agents' association and with the Engineering association.

It was voted to direct the incoming president to request the president of each of the various state electric railway associations to appoint one member to keep the member companies in such associations in touch with the work of the Committee on Standard Classification of Construction and Equipment Accounts and form of report of the Accountants' association.

Acting President Wallis appointed the following Committee on Inter-Line Accounts: W. H. Forse, Jr., Indiana Union Traction Company, chairman; Irwin Fullerton, Detroit United Railway Company; C. L. Wight, Interurban Railway Company, Des Moines, Iowa.

R. N. Wallis, treasurer of the Fitchburg & Leominster Street Railway, Fitchburg, Mass., was elected president for the ensuing year. The office of secretary and treasurer is purely honorary. H. E. Weeks, secretary and treasurer of the Tri-City Railway Company, Davenport, Iowa, was elected to fill this position.

The convention was then adjourned.

The Engineering Association.

THE American Street and Interurban Railway Engineering Association held sessions on Tuesday afternoon, Wednesday morning and Wednesday afternoon, and Friday morning and afternoon. The sessions were devoted entirely to the reports of committees, taking up the special work which comes under the jurisdiction of the engineering department, and on Friday afternoon the following officers were elected: President, Paul Winsor, Boston, Mass.; first vice-president, F. H. Lincoln, Philadelphia, Pa.; second vice-president, W. H. Evans, Buffalo, N. Y.; third vice-president, W. J. Harvie, Utica, N. Y.; secretary and treasurer, John W. Corning, Boston. Executive committee: William Roberts, Akron Ohio; E. O. Ack-

erman, Columbus, Ohio; L. L. Smith, Highwood, Ill.; Martin Schreiber, Newark, N. J.

TUESDAY AFTERNOON SESSION.

The first session of the Engineering association was called to order by President Fred G. Simmons at 2.45 P. M. on Tuesday. President Simmons then delivered his annual address. He stated that the idea of carrying on the work of the association by means of standing committees had been put into effect to such an extent that all the work presented by the association this year, excepting only the question box, was carried on by the standing committees. At the present time there were committees covering practically the entire field, but it will undoubtedly be found desirable to add, to change and to supplement these committees as further progress is made. It was advisable that the standing committees endeavor to make definite recommendations as their work progressed.

He called attention to the lack of cooperation on the part of some member companies with regard to filing complete answers to the data sheets distributed by the standing committees.

The report of the executive committee was presented, which was adopted.

The report of the secretary and treasurer was presented. This showed that the expenditures during the fiscal year ending October 16 were $1,983.86. There was a balance on hand of $4.37. The association received from the American association $1,950, and from miscellaneous sources $38.23.

The report of the Committee on Maintenance and Inspection of Electrical Equipment was presented. This report was prepared by L. L. Smith, chairman; E. T. Munger, C. C. Long, L. W. Jacques and F. P. Maize. It was abstracted briefly by Mr. Munger.

This report was developed along the same general lines as were followed last year. Specifications for important items of supplies were added and the rules governing the maintenance and inspection amplified. The general subject of the report was divided under various subheads and considered separately as follows: Carbon brushes for railway motors; Insulating materials for railway repair shop use; Recommendations of committee of last year—extent to which they have been approved and followed; Gear and pinion specifications; Lubrication; Gear and pinion lubrication; Rules for lubrication for the guidance of car-house employés; Armature and axle liners; Trolley wheels; Air-compressor maintenance; Air-compressor inspection; Time versus mileage basis car-house organization; Practical rules for the inspection of electrical equipment, for the guidance of car-house employés; Home-made tools and devices.

The committee reports a greatly increased interest in the work by the member companies, the data sheets having been filled out in a complete and painstaking manner. The thanks of the committee were extended to E. H. Anderson, of the General Electric Company, and J. L. Davis, of the Westinghouse Electric and Manufacturing Company, who rendered valuable assistance in the preparation of this year's report, and also that of last year.

The discussion was opened by E. W. Olds, who analyzed the various subdivisions and called attention to the number of recommendations which had really been put into practice by the member companies.

The committee recommended as one of the tests for carbon brushes a vibrating test using a rotating disc with a drop of one-eighth inch. One could hardly tell without trying it whether this test would be too severe. In his judgment this would seem to be the case. He was happy to say that there had been a considerable advance in the production of insulating material within recent years.

Concerning the gear and pinion specifications, it would seem that if the pinion steel was of the proper tensible strength, that the test would not show very much reduction of area. A dense and tough material must be secured. At the same time, the steel must have a high elastic limit. To-day there are very few companies using grease for lubrication, and even with old motors, oil is being very extensively employed.

Paul Winsor stated that his company had used about fifty impregnated coils with a good deal of success. With regard to babbitting, the company had held out against using patented babbitting, and had found its greatest success with the use of an expensive babbitting which ran high in tin. He had used a small trolley wheel, as light as could be got, but it had not been possible yet to convince his company that it could make any great saving by changing its procedure. He thought that the foremen's meetings were very important and helped materially in cutting down delays and improving the service. To-day the delays are one-half of what they were a year ago, and this improvement has been followed month by month throughout the year.

Mr. Adams endorsed Mr. Winsor's remarks, and said that he tried to go a little further, and in addition to decreasing troubles with the foremen, presented brief talks on interesting subjects. Representatives of the various companies had attended these meetings and talked to the men. Regarding the use of trolley wheels, he had found that the average life of a five-inch wheel was from 20,000 to 25,000 miles, as against 3,000 to 10,000 miles for four-inch wheels.

Mr. Doyle stated that in New York city service during the last year the company has secured about 3,000,000,000 miles of work with a certain type of carbon. This carbon had reduced the troubles on the Manhattan Elevated Railway eighty-five per cent, and had reduced the troubles in the subway about ninety-six per cent. The cost runs to about 17.3 cents per 1,000 car-miles, as compared with a former cost of forty-four cents.

E. Gindre, of Le Carbone Company, addressed the meeting on the matter of carbon brushes, and stated that there should be as many specifications for controlling carbon brushes as there are different grades taken as standards. He discussed the various tests. The vibrator tests he did not think corresponded closely enough to the conditions of practice. The shocks and vibrations to which traction brushes are normally subjected in actual service can not be compared with the exaggerated trial connected with the vibration test. The resistance test he had always found of value, as it answers more closely to actual practice. The abrasion test he considered would be a rational method when running the different brushes on soft material. The decrease in weight would be proportional to the abrasive coefficient. With regard to the subject of single and double widths of brushes, he thought the advantage of single-width brushes lay in a better distribution of the current, as they fitted the commutators more easily on account of their smaller section.

Mr. Brady, of the National Carbon Company, said the report was a step in the right direction. He thought, however, that most of the tests would be found impossible for most mechanics or men in the barns to make. Most of the tests were laboratory tests, which it was hard for those skilled in such work to make accurately. Unless extreme care were taken it was hard to bring the brush down to a true surface. The slip-ring test was a good test, but to his mind was more a matter of contact resistance than anything else—that is, a brush with a high-contact resistance will glow more quickly than a brush with a low-contact resistance. A brush with a high-contact resistance is a good brush to have in some cases, while one with a low-contact resistance is good in other cases. The manufacturing companies were glad to go into the matter of brush tests with anybody and make brushes for any specifications. It did not necessarily follow that if a brush would give 100,000 revolutions on a vibrator, and 300 amperes under test on a slip ring, that it would work satisfactorily on all motors.

Mr. Doyle suggested that the carbons be classified on the car-mileage basis. If their performance could be measured in this way it might prove a reasonable mark for the manufacturer to work to.

Taking up the matter of gears and pinions, Mr. Doyle said that his company had found that a special treatment of carbon steel increases its value as much as 100 per cent. It occurred to him that some suggestions might be made by the Standardization Committee with a view to designing some form of test which would indicate the wearing characteristics of different compositions of material which had been subjected to different courses of treatment.

Mr. Winsor said that the vibration test

would help a great deal. It would not fix a standard of how many vibrations a certain brush would make, but it would show that under certain conditions, if a certain character of carbon would make 20,000 vibrations or revolutions, that it would be able to live up to certain conditions.

E. E. F. Creighton presented a paper entitled "Lightning Protection for Electric Railways."

This described the new types of aluminum arresters which have been developed by the General Electric Company for street-railway lightning protection.

Mr. Anderson took up the discussion of the gear and pinion specifications given by the committee. He said that the values given in the report are within the range of carbon steels, applying particularly to the service where they would be required. It will not be wise to run tensile strength and elastic limit tests too high, because this makes the tools too brittle and they will not stand the shocks.

The discussion of Mr. Creighton's paper was then taken up, and in reply to the question whether there was any well-defined method of applying lightning arresters with reference to the number installed per mile, Mr. Creighton stated that a great deal depends upon the internal resistance of the arresters. The idea of installing five or six lightning arresters to the mile was probably due to the fact that the arresters in themselves had a considerable internal resistance. If a cloud discharges directly over a line, the more arresters installed per mile the greater freedom will there be from trouble from such discharges. The line arrester would have little effect in taking care of a discharge just over a car, and dependence would have to be placed largely upon an arrester on the car. The line arrester can take care only of the discharge in its near vicinity, and it helps out in the general protection by reducing the quantity of discharge that the arrester on the car has to take care of. It is rather an undecided question if there should be more than two arresters per mile. Mr. Creighton thought that if there were a good discharge path, two arresters per mile would be sufficient to relieve the ordinary strain.

The further consideration of the subject of lightning protection on cars, on motion, was referred to the Committee on Maintenance.

The report of the Committee on Maintenance and Inspection of Electrical Equipment was accepted, and the report as a whole referred to the incoming committee, which would have charge of these matters.

The meeting was then adjourned until Wednesday morning.

WEDNESDAY MORNING SESSION.

The Wednesday morning session of the Engineering association was called to order at 9.30 o'clock.

The report of the Committee on Standardization was presented by H. H. Adams.

This report stated that the standards adopted by the association as a result of the report in 1907 are being seriously considered by the various electric railway companies and rapidly adopted by others throughout the country. This applies particularly to axles, journal bearings, journal boxes, brake shoes, brake-shoe heads and keys, and standard section of flange and tread of wheels. The present report recommends that the standard height of couplers for interurban cars from the top of rail to the centre of the coupler should be thirty-one inches. This is the standard adopted for all steam railroad passenger cars. The committee recommends that the standard height of couplers for city cars from the top of rail to the centre of the coupler be twenty inches.

With regard to the type of coupler to be recommended as standard for city cars, the committee suggests that the subject be continued for consideration for at least another year, or until a coupler has been developed of sufficient merit to meet with general approval and suitable for adoption as a standard. In selecting a proper type or pattern of coupler for interurban cars, the committee has been handicapped from the fact that no form of automatic coupler or attachment has been developed in practical service by which interurban cars can be coupled together and can also be directly coupled to standard steam railroad cars. The committee recommends the adoption as standard for interurban railways of a coupler of a vertical plane type which will have the same contour lines of knuckle and guard arm as will automatically couple with standard steam railroad couplers. It is also recommended that the distance from the centre of the pocket pin to the pulling face of the coupler be fifty-four inches. This length will apply equally as well for cars in city service. Where a bumper arrangement will permit, the committee recommends that on city cars a pocket casting should be placed on the top of the bumper, the centre of the pocket to be thirty-five inches above the top of the rail, and the casting to be of ample strength and properly braced, so that, by means of a suitable bar, city cars can be coupled on the level with the automatic couplers of interurban cars. It would appear that for the present, at least, it would be advisable to maintain a link slot and coupling pin hole in the knuckle of the automatic couplers.

For standard height of platforms for interurban cars the committee recommends that from the top of rail to the top of platform floor the height be fifty-one inches, and that the height for city cars from the top of rail to the top of platform be thirty-one inches.

So much variance in practice is found in the different cities concerning the height of car steps that the committee merely suggests the following as recommended practice for interurban cars: Height from top of rail to top of tread of first step, seventeen inches; to top of tread of second step, twenty-nine inches; to top of tread of third step, forty inches; to top of platform floor, fifty-one inches. Similar recommendations are made for the heights of step on city cars as follows: To top of first step, seventeen inches; to top of second step, thirty-one inches; height of riser from top of vestibule floor to floor of city car, ten inches.

The committee recommends that the bumper arrangement on interurban cars be made as solid and substantial as the design of the equipment will permit, and if possible, some suitable arrangement provided which will prevent the bumpers of interurban cars from passing over the bumpers of the lower city cars.

The committee also recommends that where possible the top of bumper on city cars be reinforced with a bumper casting of suitable design which will engage the bumper of the interurban cars as well as provide a wider surface, thus preventing the bumpers from passing over and the cars from telescoping in case of collision between city and interurban cars.

The committee recommends that the standard height for bumpers on interurban cars from the top of rail to the top of bumper shall be fifty-one inches, and the height from the top of rail to bottom of bumper, forty-three inches. The standard height from the top of rail to the top of bumper on city cars shall be thirty-one inches, and the width of bumper for city cars shall be six inches.

In opening the discussion Mr. Adams said he believed that the question of the height of bumpers is one of the most important considerations presented in the report.

Mr. Doyle stated that in his lay-up yards an eight-car train, running at a speed of thirty-five miles an hour, collided with a string of empty cars. One of the cars that was laid up was equipped with a bumper plate made of a steel casting with a corrugated face. This casting prevented the front car of the moving train from telescoping the rear car of the stationary train, but the cars following the leading car climbed over each other and destroyed the ends. The corrugated bumper plate engaged the other car and prevented it climbing up at that point. The condition of the cars at the other points in the two trains was a valuable demonstration of the efficiency of the corrugated buffer plate.

Mr. Olds stated that the ordinary steam coupler was not sufficient to take care of the vertical movement which obtained where the roads changed their grade. As far as the height of platform was concerned, he thought that the committee's recommendation of thirty-five inches, which is steam railroad practice, is what should be adopted because of the many roads handling steam cars over their tracks.

In reply to a question Mr. Doyle explained that the corrugated buffer which he described was placed in the end of the sills, and as the cars come together the line of sills is maintained and the force of collision is dissipated by throwing the cars off sideways. Unless the casting is

placed right on the ends of the sills the great force of a high-speed collision would break down an ordinary platform. The construction of the car should permit the interlocking of the sills by their ends; then it is impossible for the car to telescope. If, in the ordinary city car which has a platform tied up to the main sills, the interlocking device is provided, the device is valuable only at such low speeds as the strength of the platform will resist. He did not believe it would be possible to generate speed enough to destroy the alignment of long sills. The force tends to go sideways or up, and the superstructure would break at the point of attachment to the sills. In connection with having castings provided in the structure there should be some material between the casting and the end of the sills proper to offer a resistance similar to that employed in the couplers of freight cars. There should be a dampening spring or some other provision made to absorb the shock, because of the effect on the passengers of the sudden stopping of steel cars.

J. F. H. Wyse, of the Toronto Railway Commission, said that the subject of standardization is of especial interest in Toronto at the present time, as there is now before the Ontario Railway and Municipal Board an application to lower the steps of city cars. In Toronto a number of prominent physicians have come forward and stated that high steps on the cars in the city of Toronto were injurious if not dangerous. The height of step recommended, regarding which discussion has taken place, and to abolish which an application has been made to the Toronto commission, is practically the same as that which the committee suggests in the present report as standard. In view of this condition, therefore, it would seem to him that if postponing the adoption of the proposed standards and going further into the question resulted in securing a lower standard than seventeen inches for the first step on city cars, the public's best interests would be served, an immense amount of expense to the operating companies would be avoided, and a cause removed which promises to be a source of irritation between the municipal authorities and the railway companies.

The president read a communication on the subject of the height of car steps from Howard A. Kelley, a physician of Baltimore, Md., in which he entered a protest as a physician against the seventeen-inch standard, which he considered militated against the safety and comfort of women, little children and the aged.

H. W. Blake said that the New York State Street Railway Association had gone carefully into the matter of the height of car steps three or four years ago. The conclusion had been reached that there was thirty-one inches to be made up between the ground and the platform riser. If the first step is made lower, the second must be made higher. The first step one naturally takes with the right foot, and the hand rail is in position for assistance.

Mr. Adams stated that in New York the operating companies are limited in the width across sills, which is a vital point. Cars can not be built eight feet across the sill, and consequently, clearance between sills can not be obtained to enable the radiation of a truck with thirty-three-inch sills and keep the car floor low enough to give a lower step. The New York companies do have a step somewhat lower than recommended in the report, but he would point out that there are conditions which limit the height of these steps.

The report of the Committee on Power Generation was presented by G. H. Kelsay, chairman.

This report gave particular consideration to the practical operation of steam turbines, steam meters and flue-gas analyzers. The report states that the investigations of the committee have brought forcibly to its attention the apparently indifferent methods of operation practised in many power stations, and particularly in the boiler room. The committee believes that there is far too little attention given to economy in the boiler room, and that a careful and systematic use of apparatus available would result in a great saving. It is suggested that the work of the committee be continued and that further reports should be expected next year on the question of carbon-dioxide recorders in addition to an investigation into the use and merits of draft gauges, pyrometers and systems of damper control. It is also suggested that an investigation as to the merit of buying coal on a basis of analysis should receive attention by such a committee, together with an investigation as to the methods of making analytical tests of coal and the use of calorimeters.

The report stated that twenty out of twenty-seven replies received from companies indicated that the users considered a turbine equal to or preferable to the reciprocating engine on the score of reliability, while but five preferred reciprocating engines as to this point. For operation under varying steam pressure the replies are not so decidedly in favor of the turbine, there being five out of twenty-four replies favoring the reciprocating engine. Steam-driven auxiliary equipment is preferred under most circumstances, but especially so where the exhaust is needed to heat the feed-water. The users of steam meters seem to agree that they have found the instruments valuable for test, for measuring accurately small quantities of steam, and for getting approximate divisions of steam used for various processes. Some complain of the high cost of the meters and the small variety of uses to which a given meter can be applied.

The result of the work the committee has been able to do on flue-gas analyzers indicates that these instruments are of unquestionable value, and the records, when properly taken and interpreted, offer a means of detecting defects both in the construction and operation of boiler furnaces which might not otherwise be exposed.

Charles Hewitt, in opening the discussion on this report, said that it was his experience that in the case of turbine plants and steam-engine plants equally modern and equally well designed, there was very little difference in the steam economy. An exhaust-steam turbine with a well-designed reciprocating engine would show an economy much greater than any straight turbine plant that could be built.

Mr. Roberts said that he had been surprised at the excellent performance of the turbine under excessive overload conditions. There seemed to be almost no range of power within the possibility of the strength of the material of which the turbine is constructed that it will not work up to.

R. H. Ross said that with regard to the ability of the turbine to operate under overload, that certain types of steam turbine, particularly the impulse type, give an increased efficiency under overload. The best economy with such a turbine is obtained at the greatest load that can be carried. It is to the advantage of users of this type of turbine to put on it all the load which the generator can carry without overheating.

In taking up the discussion of flue-gas analyzers, Mr. Winsor pointed out that it was customary to weigh the coal and record the electrical output, but between these two there is almost nothing to work from. Methods of knowing how coal is being burned are needed, and it is necessary to know what the boiler and what the various other units entering into the generation of power are doing.

Mr. Hewitt stated that it was generally believed that the most satisfactory point from which to take out the gas for analysis was from the stack or near the stack. He was opposed to this conclusion. In a battery of five boilers, for instance, working on one stack, it is no indication whatever of any individual boiler's performance. As a general principle, the nearer the approach is made to the stack, the less indication of carbon dioxide is found. He has discovered that the only reliable indication which can be secured is by taking a sample of gas from about the middle of the combustion chamber. Various means of abstracting the gas have been tried, and he has finally settled down to the following scheme: A pipe is run into and completely across the combustion chamber. This pipe is perforated with holes, so that a very large sample all the way across the combustion chamber is secured. He has found that the banking of a boiler in one bank materially affects the gas in the flue and in some cases it has been found that the banking of one boiler affects the other, although the other boiler may not be banked.

It was voted to accept the report and refer the subject matter to the incoming committee.

The session was then declared adjourned.

The report of the Wednesday afternoon and the Thursday sessions will be presented in the next issue.

Claim Agents' Association.

THE first session of the Claim Agents' Association was called to order by the third vice-president, J. S. Harrison, at 3.45 P. M. Monday. The president's address was read by Charles B. Hardin, claim agent, United Railways Company of St. Louis.

The report of the executive committee showed that W. H. Weh, second vice-president, had resigned because of leaving the employ of the Cleveland Electric Railway Company to engage in other business.

The treasurer reported that the total expenses were $807.89, leaving a balance on hand of $1.37 on October 1.

The Tuesday morning session of the Claim Agents was called to order at 10 o'clock, with Vice-President Harrison in the chair.

The first paper taken up was entitled "The Organization of a Claim Department for a Small or Moderately Large Company, Including a School of Instruction as a Means of Preventing Accidents," by Francis J. Ryan, M. D., Syracuse Rapid Transit Railway Company, Syracuse, N. Y.

Dr. Ryan exhibited a set of record books and forms, and explained their use.

In discussing Dr. Ryan's paper, F. W. Johnson stated that with the Philadelphia Rapid Transit Company proper instruction had brought about a marked reduction in the number of accidents.

The second paper was entitled "The Claim and Its Disposition," by Peter C. Nickel, claim agent, New York City Railway Company.

The Tuesday afternoon session was called to order at 2.30 o'clock, and the paper entitled "Uniformity in Claim Department Records and Accounts" was read by John J. Reynolds, claim agent of the Boston Elevated Railway Company.

The paper was referred to the incoming executive committee for further consideration.

An address was made by James R. Pratt, claim agent of the United Railways and Electric Company, of Baltimore, who spoke upon the advantages he had received from joining the Alliance Against Accident Fraud.

The paper entitled "The Duties of Claim Agents and Other Officials of Quasi-Public Corporations to the Public" was presented by Eugene R. Roberts, claim attorney of the Knoxville Railway and Light Company.

At the session of the executive committee held on Tuesday evening the following nominations were presented: President, C. B. Hardin, claim agent, United Railways Company of St. Louis; first vice-president, E. C. Carpenter, claim agent, Indiana Union Traction Company; second vice-president, J. S. Harrison, claim agent, Jacksonville Electric Company; Dr. F. J. Ryan, Syracuse Rapid Transit Railway Company; secretary and treasurer, B. B. Davis, claim adjuster, Columbus Railway and Light Company.

The closing session of the Claim Agents' convention was held on Wednesday morning. President Goshorn presided and stated that the amendments to the constitution and by-laws proposed by the executive committee had been considered by the executive committee of the parent association, and it had been decided to refer them for action to the 1909 executive committee of the Claim Agents' association.

The question box was read and President Goshorn described the working of the index system in his office.

The report of the nominating committee presented at the executive session on Tuesday evening was unanimously adopted.

President-elect Hardin, after a brief address, appointed the executive committee a Committee on Employment and a Committee on Ways and Means, after which the Claim Agents' convention was adjourned.

Transportation and Traffic Association.

THE American Street and Interurban Railway Transportation and Traffic Association held its technical sessions on Monday afternoon, Tuesday morning, Wednesday afternoon and Thursday morning. The first session was called to order at 3 o'clock Monday afternoon by President C. Loomis Allen. The report of this session was presented in last week's issue of the ELECTRICAL REVIEW.

On Thursday morning the following officers were elected: President, C. Loomis Allen; first vice-president, R. T. Todd; second vice-president, G. L. Radcliffe; third vice-president, A. W. Warnock; executive committee, the officers, and G. W. Parker, H. C. Page, N. W. Bolen, H. A. Davis.

TUESDAY MORNING SESSION.

The Tuesday morning session was called to order at 9.30 o'clock.

The report of the Committee on Training of Employés was presented by J. W. Brown, chairman.

This report deals with a comparison of the past and present requirements of transportation employés. The methods of procedure of a number of companies are presented in categorical form, and the report makes the following conclusion: "The committee, after careful consideration of the various methods of discipline, and with knowledge gained through actual operation of the merit and demerit system, recommends it as being the best form of administering discipline on account of its taking notice of minor infractions of rules which otherwise would not be subjects of discipline, and also because of the fact that it makes possible commendation of good work on the part of the employés. It affords, as well, an accurate record of the employé's work in every particular."

The committee also recommends that this subject be given earnest consideration, to the end that the men operating the cars and trains may be selected with a proper view of their fitness as to intelligence, acuteness of senses, physical condition and proper aptness for the work.

In opening the discussion on this report, W. H. Collins stated that his company was securing very good results by making a careful selection of its motormen and conductors and starting to train them by putting them on cars with regular motormen, and afterward giving them an opportunity to become familiar with the mechanical equipment by a special training in the shops.

P. P. Crafts stated that the Iowa & Illinois Railway Company first selected the man for his general appearance and qualifications. He then was put through a medical examination, being given a very complete test for vision and hearing and other physical and mental qualifications. If he passed the surgeon's test he was put on a car with one certain motorman and one certain conductor. The company has one man who is especially fitted for breaking in men—that is, he has the knowledge and the moral power to make a man understand what he wants him to learn. Mr. Crafts believes that the indiscriminate breaking in of car-service employés with various motormen and conductors does not result as a general thing to the best advantage of the company. It is better to have one or two men in particular who are especially adapted to this kind of work. After the man has run for such a length of time as is required by the instructor, if he be a motorman he goes into the shop for a few days to learn the essential points of the equipment. The

conductor is examined to a greater or less extent as to his knowledge of ticket forms and the handling of the public, etc. After that both classes of employé are put on the extra list. The company selects from the extra list, after the summer season is over, the employés best fitted for the winter list or to go into regular service.

E. E. Potter, of Seattle, said that conditions in his city were governed a good deal by its great distance from other centres. As a consequence, there is more or less of a floating population. The Seattle Electric Company does not, as a rule, employ men who have had previous experience on other roads. The company has found that it gets better results from men who seem to possess the necessary physical and mental qualifications, training these men in its instruction school. The company has an equipment of dummy apparatus, with which the applicant is taught the necessary rules concerning signals, the working of the air devices, and the starting and stopping of cars. He is put under carefully selected motormen and conductors. Only men who have exceptionally good records and who possess the natural qualifications of instructors are picked for this work. The new man's work is carefully observed for a period of six months, and if he does not conform to a certain standard he is taken off the car and placed with a number of other men on an experimental car run over the various lines. He acts as motorman or conductor and is put through another series of tests and his work observed. The company also makes use of daily bulletins, which are posted each day, commenting, in the colloquial phrases that the carmen use, upon the good or bad work which has been noticed on the various lines. A general meeting of the men is held at headquarters about once a month, and some one from the other departments gives them a brief, interesting talk. The men are interested and secure a knowledge of the various parts of the system, the mechanical part of the car and the power stations, and the different points that there are around not only the company's lines, but other lines in the same section.

The men are also given short talks by the claim attorneys and the various inspectors.

Dana Stevens, of the Cincinnati Traction Company, stated that where his company has city and interurban lines operating from the same centre, the practice is to promote conductors and motormen from the city service to the interurban service, the principal reason for this being that the city rates of pay are lower than the interurban rates, and that by the time a conductor or motorman has become a proficient city man, he has reached a point where he will probably want the higher rate of wages which is paid on the interurban lines; therefore, he is promoted to the interurban, on which the lowest rate of pay is as high as the highest rate on the city lines. He has the privilege of staying on a city line, but if he wants to go to an interurban he can, with the prospect of advancement for time service there. Men between the ages of forty and fifty years of age are selected, preferably men with families, regardless of whether they are city or country-bred. If the man gives any local references these are seen personally. Of course, if his references are away from the city, these are written to. If the applicant is accepted he is sent to an instruction school, which is equipped with the various appliances with which he should become familiar. He is then sent to one of the different divisions, reporting to the superintendent, and is put on a car to be broken in. He works directly under an instructor until he is endorsed as competent to operate a car over the line in question. At the present time it is possible to make a very good selection of men, and in no case is a man known to be under twenty-one years of age or over forty-five selected.

R. S. Goff, of the Boston & Northern Street Railway Company, stated that in operating in ninety-five cities and towns some 930 miles of road, almost every condition is met. The employment of men is put directly up to the division superintendents, of which there are sixteen. As far as employing men who have been in other branches of public service is concerned, there is a rule that they shall not be employed except under the O. K. of the vice-president's office. The application is forwarded by the superintendent to the inspection department at Boston, the division superintendent taking care of everything local. The men are placed in service and broken in for varying lengths of time. The older men in the employ are selected for inspection service, and if it appears that a beginner does not get along properly with one instructor, he may be changed to another. In each division there are a few men who are selected for their competence as instructors. He did not agree with the other speakers with respect to the men having had city service making the best men for interurban service. He thought that it was the general opinion of the superintendents that the men on interurban service are far better if they are brought up in that class of service than if they are trained as city men.

C. E. Learned, of the Boston Elevated Railway Company, said that their procedure was very much the same as that described by the gentleman from Seattle. Instead of taking the extra man off a car and showing his deficiencies to the other men on the road, he is quietly instructed by a special instructor. The instructors receive ten cents a day extra for their service the year round, whether they break in a man or not.

J. E. Duffy, of the Syracuse Rapid Transit Railway Company, stated that one of his companies operates three systems: one a purely city system, one an interurban operating for thirty miles between two cities, and the other a city and interurban. When the interurban line was started—an electrified steam road of the West Shore Railroad between Syracuse and Utica—the question of providing men for this service came up. The management decided to take the old men from the two city lines and train them for interurban service. The selection was left to the superintendent of the two ctiy companies. The men were entirely unfamiliar with high-speed equipment and block signals. They were first placed in the shops when the cars were being assembled, and were paid the regular rates of wages while they were receiving instruction. There were forty-two men in the first instruction classes, and it cost the company approximately $7,800 to instruct the men necessary to man the cars. The experience of the company was entirely satisfactory in the matter of promoting the men from the city service to the interurban service, and he believed that the management was quite satisfied with the expenditure of the money.

E. F. Peck, of Schenectady, pointed out the importance of having the men subjected to a written examination. When an accident happens the men very often profess great ignorance, and the local papers take advantage of this fact to noise about a cry that the men are unfamiliar with the rules.

Mr. Duffy said that his company had felt the necessity which Mr. Peck pointed out, and that the Syracuse company took 450 of its employes and paid them for the time that was consumed when making out a written examination. This examination was placed with their record, and all men hired since that time are compelled first to pass an oral examination, which the instructor verifies in writing, and then a written examination, which the applicant signs.

The Hon. W. Caryl Ely addressed the meeting, and called attention to the fact that the present very efficient condition of the organization was an evidence of the fact that the American association is doing a useful work and a lot of it. He thought that there would be a tremendous amount of good obtained by the members of the Transportation and Traffic association from the meetings, and that the emoluments for work will constantly become greater as men become more efficient. It seemed to him that there never was a time when the opportunities were so great as they are now. He called particular attention to the fine series of pictures illustrating the Inland Empire System. Thirty years ago there were no buildings where the Shoshone Flyer now runs, and to-day in the state of Washington there are less than a million people. In spite of this in thirty years there has been the most extraordinary development.

The paper entitled "The Carrying of United States Mail on Electric Railways—Its Advantages and Disadvantages, and the Compensation Therefor," was presented by C. H. Hile, assistant vice-president of the Boston Elevated Railway Company.

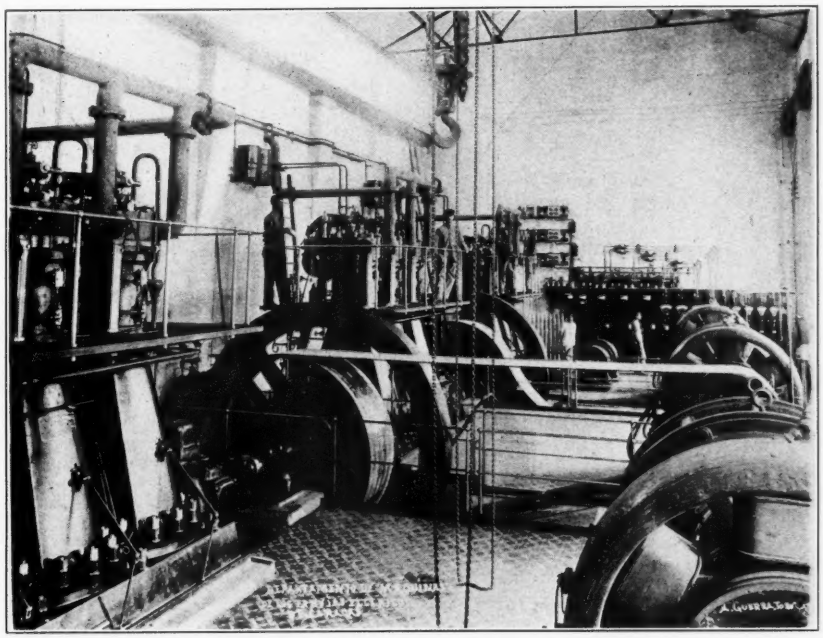
After a brief discussion of this paper by J. T. Choate, the convention was adjourned until Wednesday morning.

The report of the concluding sessions will be presented next week.

THE ELECTRIFICATION OF THE CARACAS (VENEZUELA) TRAMWAYS.

MODERNIZING ONE OF THE OLD SOUTH AMERICAN CAPITALS.

Caracas, the capital of Venezuela, South America, is the ninth in size of the twenty capitals of America. Caracas was founded by Diego de Lazada in 1564, some sixty years after the settlement of La Guaira, only ten miles away on the coast. The history of the town has been the general history of the Spanish Main. Within twenty years of its foundation the city was raided by Amyas Preston and again later in 1595 by Drake. From 1810 to 1872 there were almost constantly at least two, and sometimes more, opposing armies in the field. In 1872 Guzman Blanco came, took the presidential chair, and with him arrived a comparatively golden age for Venezuela. In 1888 the dictator, who was living in Paris, was formally deposed, and from that date revolution succeeded revolution. The reigning president, Cipriano Castro, won the supremacy in 1899, and has since held his own in spite of efforts, both internal and external, to dislodge him.



CARACAS TRAMWAYS. ENGINE ROOM.

Caracas, as has been already stated, is a town of red and white roofs, in squares. It is, in fact, built, as far as the configuration of the ground permits, on the American chess-board system.

Previous to the year 1905 there were two small horse companies in operation, the Bolivar, running east and west from the station of the Central Railway to that of the La Guaira and German lines. The other was the Caracas Tramway Company, which, starting from the Plaza Bolivar, radiated out to the different quarters of the city. In 1905 the two companies were combined under the presidency of Dr. Zuloaga, a leading member of Caraquenian society, and the directorship of Edgar A. Wallis and Albert Cherry, two of the most prominent members of the British community. A concession was obtained from the municipal authority with a view to the electrification of the whole system, and E. H. Ludford, formerly manager of the Bolivar company was appointed general manager of the whole. Mr. Wallis then went to London, where he speedily interested English capitalists in the scheme, on which J. G. White & Company, Limited, drew up a full report. Their recommendations were accepted and a contract was drawn up, whereby J. G. White & Company, Limited, undertook to supply a complete equipment, including track, office buildings, car-shed, power-house and plant and cables. Work was started in the spring of 1907 and completed by February, 1908.

The routes selected, with a total length of ten miles, were practically those of the old companies. These naturally converged into the Plaza Bolivar, the centre political and social of the city, in which and around or near which all the ministerial and government buildings are situated. The principal line is that from east to west, uniting the Central Railway with the La Guaira stations. On the north side are three routes. Of these the Pastora runs to the northwest through a fashionable district; the Avenida Norte to the Hospital Vargas, past the Panteon where are the ashes of the heroes of the independence, Bolivar and Sucre, and a monument to Miranda; while the third, the San José, parallel to this, but further to the east, runs through a working-class district to the northern boundary. On the southern side are three routes, one to the southeast to the Ponte de Hierro, where the track crosses the Guaira River and connects with a light tramway to a suburb, three miles out; a second to the due south; a third to the southwest. The last divides into two, of which one crosses the La Guaira and the other, the Palo Grande, connects with the German line at a station of that line. Besides tapping a large and populous quarter of Caracas, the Palo Grande line forms the connecting link of a chain of railways of uniform gauge stretching some 180 miles from Pto. Cabello, an important growing port to the west of La Guaira, passing through Valencia, the city second in size and importance in the north of Venezuela, and traversing Caracas, travels toward the south by the Central Railway. By the route also the Caracas meat supply is introduced into the city, the abattoir being situated a short distance from the Palo Grande Station. The maximum gradient is four per cent.

The rails are in thirty-foot lengths and weigh eighty-seven pounds to the yard, and were supplied by the United States Steel Products Export Company. They are of a pattern made especially to suit South American requirements. The tie-bars are of the Bayliss, Jones & Bayliss type. The rail are of the continuous pattern. The rails are of the continuous stringer, sixteen centimetres deep by forty-seven centimetres broad, and are anchored every fifteen feet. The paving is of four kinds—cobbles, setts, macadam and concrete. The special work was manufactured by the Hadfield Steel Foundry Company, Limited, of Sheffield. All points are automatic and of the best toughened cast steel with manganese tongues. They are ten feet six inches in length and have a centre radius of 100 feet. The mates are of solid Era manganese steel, and the rails are bonded with 0000 Brown & Sharpe concealed bonds, supplied by the United States Steel Products Export Company. The fact that no general drainage system is in use in Caracas, and that the drains in existence are principally private property and close

to the surface, caused considerable hindrance to the otherwise rapid progress of the work.

The bulk of the overhead construction consists of side poles with cross bracket arms. The junctions are formed with 7/12 galvanized steel span wire, with a breaking strain of 4,000 pounds per square inch, supplied by W. F. Dennis & Company. Only tubular poles are employed, of which 450 are of the Grand National type, their dimensions being seven and five-eighths inches diameter, bottom section, six and five-eighths inches in centre and five and nine-sixteenths inches top section, and thirty feet in length. The rest of the poles are thirty-one feet in length and are of British standard pattern. All were supplied by Messrs. Stewarts & Lloyds. The bracket-arm tubes are two and three-eighths inches diameter. The feeder boxes, supplied by Estler Brothers, are three in number, being fitted with 250-ampere quick-break switches; the section boxes, fourteen, with 100-ampere quick-break switches. The trolley wire is of the 00 Brown & Sharpe grooved type.

The feeder cables, some four miles in length, are all aerial, and are suspended from cross-arms on the poles above the brackets. They are all of pure aluminum with a size of 0.33 and 0.25 square inch, and have a conductivity sixty per cent of that of copper wire, with a conductivity of ninety-nine per cent of Matthiessen's standard of pure copper. They were supplied by the British Aluminum Company and covered by the Silvertown India Rubber & Gutta Percha Company, with triple-braided weatherproof insulation and compounding over all.

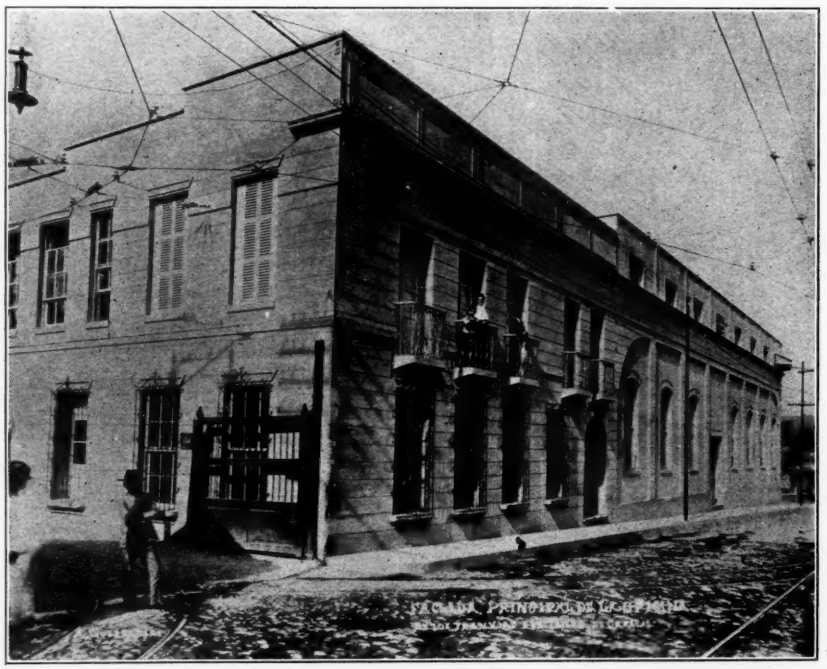
The power-house, office buildings and car-shed are all built on one site on the north of the Avenida Este. The plot is rectangular and with a frontage of 53,870 metres and a depth of 43,520 metres. They are all of brick with steel girders and roofwork obtained from Brown, Duncan & Company, of Bootle. The roof coverings of the power-house and car-shed are of galvanized iron, but the office buildings and manager's dwelling are tiled. The doors and window frames are of cedar.

The car-shed is situated at the back. Its dimensions are thirty-five metres by 12.34 metres, and its walls are six metres in height. It contains five tracks, two of which have a pit and are supported on iron columns. The floor and pit are concreted. The rails in the entrance and car-shed are the American Society of Civil Engineers seventy-pound tee rail, and the paving at the car-shed entrance is cobble.

The frontage is taken up with the office buildings and the power-house, over which is the manager's dwelling. The office buildings are all on the ground floor and cover an area of thirteen metres by eleven metres. It is subdivided into manager's, clerks' and accountants' rooms, and men's waiting room, and is provided with lavatory fittings by Doulton & Company. The first story has been arranged to serve as a residence for the manager of the company, who can thus exercise the unusual close supervision requisite in training an inexperienced staff. The roof over the shops was also adapted to serve as a roof garden, providing a cool and pleasant place of retreat in the tropical evenings. The rest of the road frontage is taken up with the engine room, with a length of forty-four metres and a depth of eleven metres and a height of ten metres, while behind the engine room is the battery room, with a floor area of nineteen metres by seven metres, and the machine, carpenters' and other needful shops, the whole making one compact and self-contained system.

There are two aspects from which the power-house may be regarded, either as a substation for a high-tension current or again as an independent producer. As a substation it is employed to transform from 4,500 to 500 volts. The high-tension alternating-current is obtained from the electrical company of Caracas. This company has two stations, at Encantado and Los Naranjos, about sixteen kilometres from the capital. There are four generators at each station and more machinery is now being introduced. The motive force is the water of the Guaira River, which has a fall of thirty-eight and one-half metres and 154 metres at Encantado and Los Naranjos, respectively. During the day the power is supplied by the electrical company.

In the evenings, however, when the town is lighted electrically, and also during stoppages which may occur occasionally, the power is produced in the power-house itself. This is effected by three Diesel engines of 240 brake-horse-power each, running at 180 revolutions per minute. The Diesel engines were selected on account of the high price of coal. They have, moreover, an additional advantage in that no delay need occur in starting them, an advantage which is obvious in the case of a sudden interruption of the high-tension transmission. The engines are belted to three motor-generators. On the induction-motor side these are designed for 5,000 volts, three-phase with fifty cycles, while on the direct-current side they yield an output of 150 kilowatts at 550 volts at a speed of 500 revolutions per minute. The station is also furnished with a battery of 260 Tudor cells, with a



CARACAS TRAMWAYS. EXTERIOR VIEW OF OFFICES AND MANAGER'S HOUSE WITH ENGINE ROOM ADJOINING.

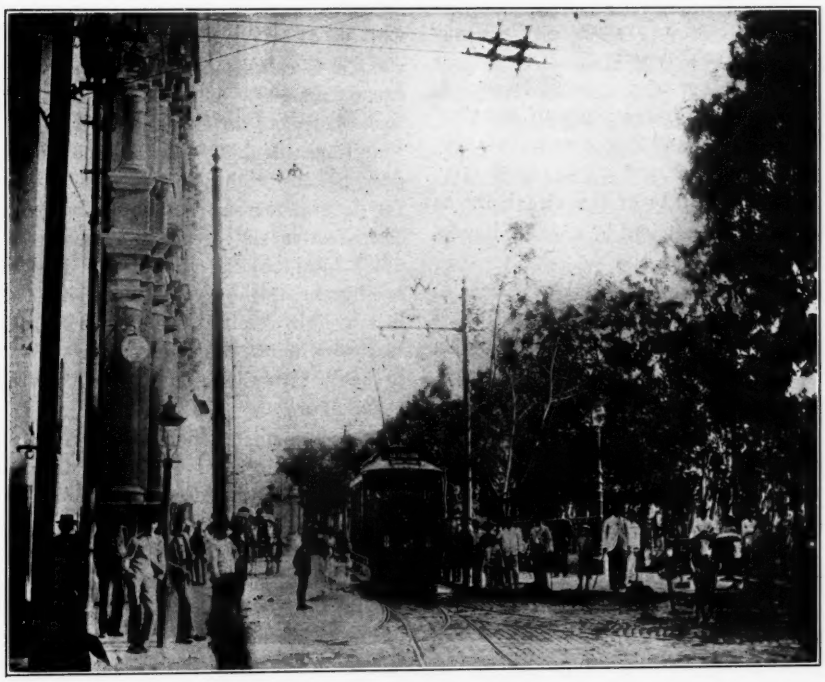
capacity of 520 amperes for one hour and 252 amperes for three hours, the maximum charging current being 252 amperes. The Lancashire Dynamo and Motor Company has supplied one of its automatic reversible boosters. The regulation with the battery and booster is such as to keep the load on one or two generators operating in parallel (*i. e.*, 150 kilowatts or 300 kilowatts at 550 volts) constant within eight per cent over or under the normal load of 272 or 544 amperes, provided the maximum load does not exceed 100 per cent of the normal load of the set or sets running. In case of 150 per cent overload, the variation does not exceed ten per cent and in the case of 200 per cent overload the variation does not exceed twelve per cent.

The switchboard consists of ten panels, *viz.*, one high-tension incoming feeder panel three-phase, 5,000 volts between wires. Three induction-motor panels, one battery and booster panel, three direct-current generator panels and two feeder panels, all fitted with the necessary instruments. The board and motor generators were supplied by the General Electric Company, of New York.

The cars, thirty in number, each with a seating capacity of thirty-two, are of the open single-deck type. The car bodies were supplied by Miles, Voss & Company, Limited, of Birkenhead.

The body framing and flooring are of teak and the roof of aluminum. The seats are of the garden-seat pattern, four being reversible and four stationary. They extend transversely the whole width of the car. Storm curtains are provided at the open sides. There are destination indicators and also lifeguards of the Hudson and Bowring type at each end of the car. The trucks are all of the Brill pattern and were manufactured by the United Electric Car Company, Limited.

CARACAS TRAMWAYS. SPECIAL WORK, UNDER CONSTRUCTION.



CARACAS TRAMWAYS. CONSTRUCTION AT THE CATHEDRAL CORNER OF PLAZA BOLIVAR, CENTRAL SQUARE OF THE CITY.

The electrical equipment of each car is composed of double-motor GE-58, four-turn, thirty-seven-horse-power for 500 volts. It includes also two B-18 controllers with one set of handles, magnetic blowout circuit-breaker, etc. With a view also to the sharp street corners and heavy gradients, each car has in addition to the mechanical brake one Westinghouse magnetic track brake.

From the commencement of the work by J. G. White & Company, Limited, under the supervision of J. G. Rose, in March, 1907, to its completion in February, 1908, the ordinary horse-drawn tramway traffic was in full operation. The traffic and construction were so arranged that during the whole period of conversion little, if any, diminution, took place in the receipts of the tramway company.

Meeting of the American Society of Mechanical Engineers.

The November meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, 29 West Thirty-ninth street, on Tuesday evening, November 10. Franklin Phillips, president of the Hewes & Phillips Iron Works, Newark, N. J., will make an address on "The High-Powered Rifle and Its Ammunition—Instruments of Precision," illustrated by lantern slides.

Mr. Phillips is an expert marksman, and in 1903 won the position as first alternate on the international rifle team to England. He was for many years chairman of the committee on rifle and pistol practice in the National Guard of New Jersey, and is now ordnance officer of the Second Infantry of that state.

Tests of rifles and ammunition at Sea Girt, N. J., by men connected with the New Jersey National Guard have led to marked improvement in arms and ammunition and to an entire change in the powder used by the Government, thereby greatly increasing the accuracy of the shot. The improvement has been extended to large guns, and instead of two per cent hits which were made at Santiago, eighty per cent is now the average in some ships.

Mr. Phillips has actively participated in this work, and as he is primarily a mechanical engineer, as well as a marksman, he will explain to his audience the practical bearing of his investigations upon the construction of arms and the elements entering into ammunition.

THE INTRINSIC BRIGHTNESS OF LIGHTING SOURCES.[1]

BY J. E. WOODWELL.

The importance of intrinsic brightness as a factor in practical illumination has been long appreciated and strongly emphasized. At no time has this factor been more essential from the standpoint of hygiene of the eye than the present. The opportunities for violation of the laws of hygiene have not only been enlarged but the penalties of such abuses have been greatly augmented, with the general introduction of the more recently developed lighting sources of high intrinsic brightness, such as the metallic filament incandescent lamps, flaming arc lamps and high-pressure gas lamps. In too many of the recent installations the most dazzling gas and electric lamps are ruthlessly placed in such positions that the eye can not escape the glare. Moreover, the distressing brightness of the source is often intensified by the improper use of concentrating reflectors.

Briefly, any brilliant source of light in the field of view, however small, causes a contraction of the pupil of the eye and reduces the effect of illumination received from other parts of the visible field. A contraction of the pupil also takes place even if the bright spot is viewed only occasionally. Furthermore, the continuous or occasional presence of a bright light source in the field of view impairs, temporarily at least, the sensitiveness of the eye itself, thus again reducing the effectiveness of illumination. Moreover, the contraction of the iris in the presence of bright light sources soon reaches the limit of its protective faculty, beyond which it responds feebly to an increase in brightness. The control of the pupillary aperture appears to be designed to strengthen the vision under comparatively weak illumination, rather than to protect against excessive intensity or brightness.

Recent researches of André Broca and F. Laporte[2] indicate that the pupillary contraction caused by bright light sources within the peripheral vision reduces visibility in proportion to the decrease in working illumination and produces the greatest eye fatigue in comparatively weak illumination. The exhaustion and injurious effect was greatly reduced on the other hand under an illumination of from 1.86 to 3.72 foot-candles, which was shown by tests to be favorable for work, taking into consideration the physiological properties of the eye and the mean limits of its accommodation.

The intrinsic brightness of the luminous source rather than the distance of the source from the eye was shown to be the principal cause for pupillary contraction. This same careful investigation also made it evident that the different light sources may be classed—with reference to their action in producing pupillary contraction and residual images—in the order of their respective intrinsic brightness.

The researches referred to above as well as other previous investigations do not indicate that the protective faculty of the eye is susceptible to the energy effect or to light rays of different color.

Ultra-violet rays have been regarded by some authorities as harmful, but it has been shown that these rays in the light from various forms of incandescent illuminants of high intrinsic brightness are with few exceptions, much less than in direct or even reflected sunlight. Other invisible radiation of much more harmful character may accompany not only the newer light sources of high incandescence but those of lower temperature as well.

The more important hygienic effects of light sources of high intrinsic brilliancy within the field of vision may then be summarized as follows:

1. Contraction of the pupil is caused, thereby reducing the amount of light entering the eye and the consequent visibility.

2. The sensibility of the visual organs is temporarily impaired by residual images and retinal fatigue.

3. The effects of (1) and (2) are also produced by the occasional view of bright sources or by subjecting the eye to sudden fluctuations of light.

4. Intrinsic brightness rather than the distance of the source from the eye is the principal cause for pupillary contraction.

5. The harmful effects are greatest in proportion to the decrease in the working illumination and are considerably reduced under an illumination exceeding two foot-candles.

6. The different luminous sources may be classed with reference to producing pupillary contraction and after images in the same order as their respective intensities.

In applying the knowledge of the laws of hygiene of the eye to the design of artificial illumination, the best criterion of the proper values of intrinsic brightness of the light source, as well as of other essential factors, is daylight.

The intrinsic brightness of nearly all of the artificial light sources being so much higher than that of natural daylight is the principal cause of eye-strain and wear and tear on the visual organs. Even the most successful efforts to secure diffusion in artificial illumination by the so-called indirect method can not be compared with the diffusion of daylight. From this point of view diffusion is the most important single quality of daylight. Diffusion may be obtained in artificial illumination by enlarging the area or surface of the light source, by shading the source with diffusing globes or screens, or by concealing the source and utilizing the diffuse reflection of the surfaces which receive the direct light.

The intrinsic brightness of a light source is the candle-power or intensity of the source divided by the area of the luminous surface. The intrinsic brightness of a small surface is the candle-power perpendicular to the surface divided by the area of the surface. Intrinsic brightness is stated, therefore, in candle-power per square inch, or in hefners per square centimetre when metre units are employed.

Measurements taken by Basquin show a mean annual brightness for zenith sky in Chicago of 500 candles per square foot, or about 3.47 candles per square inch, with a range from 200 to 1,100 candles per square foot according to the month and other conditions. Making due allowance for the decrease in brightness near the horizon for natural reasons, and the reduction of the effective sky area by buildings and other local objects, the virtual intrinsic brightness of the sky in relation to the flux of light received through an ordinary vertical window, under average conditions probably rarely exceeds one-fourth of the above figure.

Measurements of the daylight illumination received in rooms at various distances from a window fitted with a ground-glass screen indicate also that the vertical brightness of the flux of light from the sky, direct sunlight excluded, though varying widely under different conditions, is not often more than one candle-power per square inch. Even such a comparatively low degree of brightness exposed to view affords discomfort to the eye. Shades and screens are depended upon to modify all but the most moderate natural brilliancy so that with a satisfactory interior illumination the virtual intrinsic bright-

[1] Abstract of a paper presented to the Illuminating Engineering Society, Philadelphia, Pa., October 5-6.

[2] Étude des principales sources de lumière au point de vue de l'hygiène de l'oeil. MM. André Broca et F. Laporte. *Bulletin* of the Société Internationale des Électriciens, vol. viii (2d series), No. 76.

ness of the flux of daylight through windows may be as low as 0.1 or even 0.01 candle-power per square inch.

Even an abnormally high illumination of ten foot-candles on a white diffusing surface, such as white blotting paper, gives an intrinsic brightness of the surface very little more than 0.005 candle-power per square inch, neglecting absorption which would reduce the apparent brightness to 0.004 candle-power or less.

Compared with such figures the intrinsic brightness of all of the naked artificial luminous sources is enormously high, while the values secured in actual practice by the use of shades and diffuse reflecting surfaces are generally more than ten times as great.

A number of authorities regard four or five candle-power per square inch safe and admissible and one or two candle-power good practice. While the use of even the lower of these values in artificial illuminations is questioned, it would result in a most pronounced improvement from the hygienic standpoint and alleviate one of the principal causes of eye-strain and fatigue.

Acid-frosted or sand-blasted incandescent carbon or metallized-filament lamps as commonly used in exposed positions without reflectors have an intrinsic surface brightness of from 0.75 to 1.0 candle-power per square inch. When in the field of vision, however, such frosted lamps frequently produce a most distressing and harmful result, and reduce the value of the effective illumination.

In consideration of the foregoing data, as well as from actual experience in the design of illumination, it is the opinion of the writer that from 0.2 to 0.1 candle-power per square inch is none too low for the safest and best practice where artificial sources must necessarily be placed in the constant or even occasional field of vision. The use of such a factor is necessarily dependent upon the local conditions and especially upon the intensity of general illumination of the objects viewed and the corresponding pupillary aperture, as noted by Broca and Laporte.

In the presence of a highly illuminated field of view the iris diaphragm of the eye is "stopped" down almost to a minimum, and the direct effect of any light sources within the field of vision is correspondingly lessened. These conditions occur in practice where a room or space is almost uniformly illuminated by exposed lighting sources of high brilliancy and there are neither dark surfaces, sharp contrasts nor shadows which would require the eye to work with a larger pupillary aperture. Such conditions, while tending to reduce the deleterious effect of brilliant light sources, are not the most favorable for best vision. Working in such an environment it is not strange that a comparatively high intensity of illumination in foot-candles is frequently demanded and the eye appears insatiable. From the standpoint of efficiency, therefore, as well as of hygiene, the conditions must favor a pupillary aperture which is sufficiently large to work the eye at its maximum sensibility. To accomplish this result the intensity of illumination should not only be moderate, in general from 1.5 to four foot-candles, but the intrinsic brightness of the sources should be reduced to 0.2 or 0.1 candle-power per square inch; or else the sources must be completely excluded from the field of vision.

With a weak illumination, however, requiring the eye to work at or near the limit of opening of the pupillary aperture the eye is extraordinarily sensitive to the direct light from sources of even moderate intrinsic brightness, and under such circumstances the actual apparent surface brightness of the source can not be kept too low for safety. This point is illustrated by the distressing effect of frosted and shaded lamps, and sometimes of candles, in the field of vision under the conditions of a weak general illumination frequently found in theatres, churches and auditoriums.

It is possible that the effects of overstimulation by means of varying intrinsic brightness has some such relation to the pupillary aperture through the range of accommodation of the eye as that of the ability of the eye to note a constant fractional difference in luminosity through a wide range of intensities of illumination, according to the law of Fechner.

The distance of the luminous source from the eye within the limits ordinarily found in interior illumination does not appear to be material, except in its relation to the position of the source and its inclusion or exclusion of the field of vision.

The preceding discussion has been confined to the direct effects and modification of the intrinsic brightness of luminous source, but it is evident that the same conditions will apply equally well to the reduction of the intrinsic brightness of all illuminated surfaces which become secondary sources of illuminations. Even with indirect illumination the ratio of brightness of the reflecting surfaces to that of the illuminated field may be excessive.

The foregoing data will have their principal application, however, in the design of globes and shades which are commonly employed to reduce the intrinsic brightness of exposed lighting sources. In arriving at the resultant intrinsic brightness it is necessary to refer to the spherical candle-power of the source and to make allowance for the absorption by the glass which may vary between from fifteen to twenty-five per cent for alabaster to sixty per cent or more for opal or porcelain glass. The absorption by ground glass will vary according to the process employed in roughing or sand blasting, but it will generally be between twenty and forty per cent. The thickness as well as the quality of the glass will also have a marked influence upon the absorption. Moreover, the distribution of the light from this source will be modified by surrounding the lamp with an inclosing globe. The most perfect diffusion will be received by a ground opal glass, but at a sacrifice of from forty to sixty per cent of the total light. The more transparent glasses, on the other hand, do not sufficiently diffuse the light from the source. In any event, however, it is important that the size of the diffusing globe or shade should be proportioned to the candle-power of the source, so that the reduction of intrinsic brightness will be approximately uniform. Fixture designs employing exposed frosted lamps together with other lamps in large inclosing globes of comparatively low intrinsic brilliancy are especially objectionable.

Belgian Electrical Industry.

Consul-General Ethelbert Watts announces that in the Brussels district of Belgium there are several underground tramway lines worked by two different companies. The companies employ their own staffs for their construction work.

The work of laying the underground telephone system is carried out on the contract plan.

A concession for an electric tramway has just been granted in Namur.

Projects are under way for electric lighting plants at Anderlecht, Etterbeek, Auvelais and Montaigu.

The Electric Club of Chicago.

The Electric Club of Chicago was addressed, at a meeting held on October 14, by W. J. Warder, Jr., of Roth Brothers & Company, on the subject of "Direct-Current Elevator Motors." On October 21 the club was addressed by W. T. Dean, of the General Electric Company, and next Wednesday the address will be made by Peter Junkersfeld, of the Commonwealth Edison Company.

Illuminating Engineering Society—II.

Report of the Second Day's Sessions of the Convention Held at Philadelphia, Pa., October 5 and 6.

(Concluded.)

TUESDAY MORNING SESSION.

THE first paper taken up Tuesday morning was entitled "Intensity of Natural Illumination Throughout the Day," by Leonard J. Lewinson. This dealt with the intensity of illumination produced by natural sources of light, such as the sun, moon and stars, modified by the earth's atmosphere. Experiments were undertaken to secure data under various atmospheric conditions at different periods during the day. To make a complete survey of the subject would involve years of effort. A problem which is open to discussion, and which is of much importance can be summed up in the question: Why does the human eye, which is satisfied with an illumination of two foot-candles produced at night by an artificial source, require at least twenty foot-candles of daylight for ordinary reading purposes? Two Sharp-Millar photometers equipped with miniature tungsten lamps were used. The experiments were conducted on the roof of the Electrical Testing Laboratories in New York city, where there was practically no obstruction to the light from the sky. Tables and curves were given, showing the variation of the intensity of natural illumination. Considering first the night illumination, it was noted that the sky light value approximates one-one-thousandth foot-candle when the moon is not visible. The rate of illumination during the hour preceding sunrise is enormous. When the observation was made, at 5.25 A. M., about seven minutes before sunrise, the illumination was 10,000 times that at 4.25 A. M. During the hour after sunrise the rate of increase is relatively small. When the sun first appears above the horizon the horizontal illumination is about equal to the normal. After the sun is well above the horizon the normal illumination increases more rapidly than the horizontal. During the later morning hours there is a steady increase of both horizontal and normal illumination. A correspondingly regular rate of decrease is noticed after noon and until 6 o'clock, when the falling off becomes more marked. A fair average figure for horizontal illumination produced by moonlight and sky light on an ordinarily clear night is about fourteen-thousandths foot-candle. The daylight illumination varies in intensity from 2,000 to 8,000 foot-candles between the hours of 8 A. M. and 4 P. M.

The discussion was opened by Carl Hering, who remarked that it seemed apparent that we should adapt our artificial illumination or night illumination to correspond with daylight to make the best use of our eyes. It might be of interest to know that the maximum illumination obtained—12,000 foot-candles—corresponds to the intrinsic brightness of the Welsbach mantle. He did not care to assume any responsibility for the data, but he pointed out that if the conversion factor of 452, by which the candles per square inch are multiplied, are reduced to foot candles, it would indicate that a piece of paper exposed to daylight is as bright as a Welsbach mantle. If the figures are correct this is the case.

J. E. Woodwell raised the question whether the two values indicated here—that is, the horizontal component and the normal component—were as important as the vertical component, as practically all of the light which enters modern structures comes in through vertical windows. In future work of this kind he would suggest that measurements be made of the vertical component of illumination, and that data be secured concerning the effect of the reflection of the exterior walls and buildings upon street lighting.

Emile G. Perrot said that he had made a number of observations concerning the relative efficiencies of daylight at various times of the year. The test described, being made in September, he thought did not give any real value from a practical standpoint in designing a building, for the information that is really required by the architect should cover the entire year, as the illuminating value of the sun changes all the year round. We must remember that the sun in winter is lower in the horizon than in summer, and consequently the penetration of the sunlight into a room in the vertical plane would be greater in winter than in summer. Again, the sun sets and rises in different positions at different times of the year, so that the position of a building may be right for one time of the year and wrong for another.

A communicated discussion of this paper by R. S. Hale called attention to the fact that it is evident that in street lighting the intensity of illumination in the morning daylight, say, an hour before sunrise, is higher than the same time in the evening daylight, say, an hour after sunset. For that reason he considered that municipal schedules for street lighting can be regulated to economize in the use of artificial light in the early morning hours. He also called attention to the physiological effect upon the retina of the eye of a person who has been working at night out in the open. The retina is more extended in the morning hours, so that it takes in more of the reflected light than it does at any other time.

In closing the discussion Mr. Lansingh stated, in answer to Mr. Woodwell, that there was considerable question with regard to the measurement of ordinary illumination. It was hard to decide which way to turn the photometer—whether away from the sun, or toward the sun, or at an angle. Measurements will probably have to be made in a great many planes, and the paper was simply an introduction to the subject. He would point out, however, that all measurements of illumination made during the day would be measurements of the sunlight plus the sky light.

The paper entitled "The Integrating Sphere in Industrial Photometry," by Dr. Clayton H. Sharp and Preston S. Millar, was read by Dr. Sharp. This paper described the integrating sphere, sometimes known as the Ulbricht sphere, which was first put into practical form in 1900. It consists, briefly, of a hollow sphere containing the source of light, and coated inside with a white diffusing paint. Into the side of the sphere is set a small window of diffusing glass, the brightness of which, when the direct rays are screened from it, measures the total luminous flux within the sphere. The theory of the integrating sphere is as follows: If a source of light having a uniform distribution of candle-power is suspended at the centre of a hollow sphere, the illumination at any point on the surface of the sphere is proportional to the mean spherical candle-power or to the total luminous flux of the source. If, however, the source be moved away from the centre, this relation no longer is true. If the interior of the sphere is coated with a white diffusely reflecting coating, obeying Lambert's law, the illumination at any point of the surface may be regarded as being made up of two component parts: first, that due to the light falling on it directly

from source; and, second, that due to reflection from all other sources of the surface of the sphere. During the past two years experiments have been made with integrating spheres at the Electrical Testing Laboratories in New York, with uniformly favorable results. In using the integrating sphere reliance must be placed in the substitution method of photometry. The sphere may be used in conjunction with existing photometric apparatus. At the Electrical Testing Laboratories an eleven-inch sphere has been used with small lamps. A thirty-inch sphere is used with a simple Lummer-Brodhun photometer. An eighteen-inch sphere and an eighty-inch sphere are used with a convenient type of portable photometer.

The discussion was opened by Francis E. Cady, who asked whether any investigation had been made of the effect of the collection of dust or dirt on the inside of the sphere on the diffusing surface.

H. Thurston Owens asked if this type of photometer had been used for gas lamps, such as gas arcs.

Alfred A. Wohlauer asked whether the theory of the integrating sphere could be applied to the precalculation of the illumination due to reflection from walls or ceilings.

In closing the discussion, Dr. Sharp said that they had made no investigation with regard to the effect of dust, because the simplest thing to do was to take the dust off.

As to the measurement of large gas lamps, this would undoubtedly be entirely feasible.

With regard to the measurement of large reflecting surfaces, Dr. Sharp did not quite see the direct connection between the constants of the sphere and the constants of the rooms when measuring the light reflected from walls and ceilings.

The paper entitled "The Ives Colorimeter in Illuminating Engineering" was read by Dr. Herbert E. Ives. This paper described the Ives colorimeter, designed by Frederick E. Ives for the measurement of all colors in terms of three primary colors. By means of the colorimeter it is possible to describe a color accurately in terms of the red, green and blue components of a standard white light. For instance, in place of the indefinite term "pink," a color may be designated as red, sixty-two; green, thirty-one; blue, fifty. These figures mean that by mixing red, green and blue light in the proportions given, there is produced to the eye the sensation of pink. Two colors alike to the eye measure alike in the colorimeter. In this it differs from the spectrophotometer, which gives the intensity at every point in the spectrum, but only an approximate indication of how the eye will compare the color in question with another. A table was read showing the red, green and blue readings of various sources of illumination. From the observations made it would appear that the best light for matching colors is that of the Welsbach mantle, while that of the Cooper Hewitt lamp—an extremely selective source—exhibits wide deviations.

D. McFarlan Moore opened the discussion on this paper, and stated that in his opinion the light from the carbon-dioxide tube should be given the first place in its approximation to daylight. From the paper he would draw the conclusion that the mercury arc would be preferable to a carbon-dioxide tube over a ribbon counter in a drygoods store. This statement, he said, was misleading. As a substitute for natural light the carbon-dioxide tube was superior to all others. He quoted the results secured by a number of authorities, which would indicate that the spectrum of the carbon-dioxide tube, when passing an electric current, differed very slightly from daylight. Mr. Moore called attention to tests carried out by Professor Utzinger for the Siemens-Schuckert Company in Germany. The figures obtained in these tests differed very materially from those given in the paper. Professor Utzinger makes the statement that the carbon-dioxide tube does not differ from daylight more than three per cent on a cloudless day. Mr. Moore also took exception to the method which was used in effecting a comparison of the illumination of the tubes in the New York Post Office, upon which the data given in the paper were based.

Dr. E. P. Hyde explained the circumstances under which the tests were made. Every precaution was taken to secure an accurate reading, and he felt convinced that the figures given by Dr. Ives were not far from correct.

Frederick E. Ives stated that he had made the tests described in the paper, and that direct comparison was made with the light from an electric lamp. It seemed to him that the carbon-dioxide tube comes nearer to daylight than any of the other artificial illuminants used in these tests. His impression was gained perhaps because of the steadiness of the light and because it was rich in blue lines. He thought that it represented the color of a rather blue sky than average daylight.

E. L. Elliott stated that he had the greatest admiration for the work of Dr. Ives, and that it was reasonable to expect something very practical in the way of color measurements; but to put the carbon-dioxide tube as bluer than the mercury lamp introduced a discrepancy which it seemed to him was too large to be explained away. He did not know of any light sources which had been introduced for commercial use which were wider apart in their appearance, and an instrument that would confuse these things would not be of the most reliable character.

Dr. Hyde, in answer to Mr. Elliott, stated that during the time of the test three observers had stood in the room and had in perspective the carbon-dioxide tubes and the mercury-vapor tubes. The consensus of opinion was that, of the two sources, the carbon-dioxide tube was slightly bluer and the mercury-vapor tube slightly greener. The conclusion was that there was very little difference in the integral result—that is, in the apparent color, and it so happened that the data, when worked up, confirmed the observations made on the spot.

The paper entitled "Calculating and Comparing Lights from Various Sources" was read by Carl Hering. This paper was an attempt to clarify the apparent mistiness surrounding many of the calculations of light by giving the formulæ in such form that they can be directly used for numerical calculations, and to explain in plain terms some of the less usually understood, but often very useful, and perhaps not generally understood laws. It was also an attempt to show what the real physical meaning is of the various quantities involved, so that they may be used more intelligently. The paper proceeded to throw into the form of equations the fundamental relations existing between the various factors involved in the calculations, and also gave graphical demonstrations of the methods by which these relations were arrived at. Eliminating literal factors, the conclusions were represented directly by the physical name given to the terms involved in the equations.

Dr. Sharp discussed this paper at length from the point of view of its definitions, and called attention to the necessity for caution in accepting the dicta laid down.

Alfred A. Wohlauer discussed the paper with regard to its application for certain measurements wherein the data given

were at variance with the practice generally observed.

In his paper Mr. Hering defined the flux of light as representing the quantity of light radiation, as that which is bought, sold and used—that is, the statement of the amount of flux alone, without any further specifications, is not sufficient for industrial purposes.

Both Dr. Sharp and Dr. Hyde believed that the proper way to define flux would be as it was naturally used in practice, in terms of the quantity of luminous energy flowing across a surface of unit area per second; in other words, make specific flux a point function. Dr. Hyde did not believe that the spherical candle is the common unit of flux, and that we could not consider the official unit as a lumen.

E. L. Elliott said that the fact that so many authorities hold opposing ideas concerning the common unit to be used in the measurement of light was a sufficient evidence of the chaotic state in which photometric measurements still are. He could see no discrepancy in taking the spherical candle-power as the practical unit of flux of light. He believed that this term was understood by ninety-nine where there would not be one found who would know what the word "lumen" meant. As far as the hefner was concerned, it had the virtue of being established from an official source. If we traced the official candle which we call official in this country to its source, he supposed we would ultimately land in the Reichsanstalt in Germany.

In closing the discussion on this paper Dr. Hering said that he was simply taking things as they were. He agreed that as long as we use certain expressions to convey certain meanings, we should accept one term to mean one thing. If certain formulæ were not acceptable, they, of course, could be omitted. As far as the Geneva Congress was concerned, it was a matter of record that it was the first body to define the lumen, the lux and other units.

TUESDAY AFTERNOON SESSION.

The first paper taken up on Tuesday afternoon was entitled "The Calculation of Illumination by the Flux of Light Method," by J. R. Cravath and V. R. Lansingh. This paper was presented by Mr. Lansingh.

This paper described certain methods employed by the authors in calculating the illumination of large interiors, and showed the practical application to the suggestions made by Dr. Clayton H. Sharp in his presidential address before the first annual convention of the society, at Boston, July 30, 1907.

P. S. Millar called attention to the desirability of collecting and tabulating data bearing upon the coefficient of utilization of light. The ratio between the flux of light applied in a given installation and the values of the light generated, is a valuable factor. If we can determine that ratio in such a manner as to apply it in practice to rooms of various sizes, with decorations of various characteristics, we can readily work out complete illumination schemes before the installation is made.

The next paper was entitled "Street Lighting with Gas in Europe," by E. N. Wrightington. This paper was presented by R. C. Ware.

This paper described the types of burners which are being utilized for lighting Continental European cities. The inverted lamp seems to have been pretty thoroughly tested on the other side, and has given good results. The efficiency for useful light obtained greatly exceeds that of the upright lamp. There are two reasons for this advantage: first, because the proportion of light below the horizontal is much greater than from an upright mantle, and because the construction of the inverted-mantle burner permits the use of reflectors which will collect the upright rays and turn them in a useful direction. Most of these lamps are equipped with a pilot flame, and the main lamp is ignited by means of a lever arm. The most striking feature of street lighting on the other side is unquestionably the use of high-pressure inverted gas lamps. These lamps are found in very large units, running as high as 3,600 mean lower hemispherical candle-power. Posts are placed near together, and the streets are almost as bright as if lighted by daylight. The light is well diffused, and the effect very soft and pleasing.

Walton Forstall, in opening the discussion on this paper, asked whether there was any special pressure used with the intensified lights. He believed that at the gas exhibition in Dublin last year the pressure was sixty inches.

Dr. Bell replied to this question, to the effect that the sixty-inch pressure is the highest pressure that is being used with compressed gas. Compressed gas started a few years ago at ten or twelve inches; then it went to sixteen, and then to twenty, thirty and forty, and it has now reached sixty inches, which is the exact pressure of the system in Berlin. The distribution is through steel tubes, which are put together with gaskets. The lights are supplied by a tube-pressure pumping station operating gas engines. In Berlin the system uses compressed gas, and that seems to be the more usual tendency, although some of the systems use compressed air, and one system in Paris actually feeds oxygen obtained from liquid air to the burner to intensify the light.

T. J. Little, Jr., stated that he had recently experimented with seventy-one inches with a special mantle, with good results. He believed that this will revolutionize the whole business as far as high-pressure lighting goes.

Dr. Bell stated that to remove a possible misapprehension, it should be known that in the pressure gas burners the pressure is maintained to inspirate a sufficient quantity of air to give an intensified flame. There is in no case such a pressure of sixty inches against the mantle.

The paper entitled "Design of the Illumination of the New York City Carnegie Libraries" was read by L. B. Marks.

In this paper the author discusses the characteristics which are involved in the illumination of a public library. The layout of the various divisions is indicated, and the method adopted in providing just that illumination best suited for the service involved. The features of the design include: freedom from glare, all the lamps being shaded; the intrinsic brightness of the lighting sources is kept down to one-tenth of a candle-power per square inch; the general illumination is one foot-candle on the horizontal working plane; the horizontal illumination on reading tables is five foot-candles; the vertical illumination on the book shelves ranges from one and one-half to four foot-candles; the horizontal illumination on the book shelves ranges from four to eight foot-candles; the ceiling pendents for general illumination are designed for efficient use of tungsten lamps; lights near windows are placed on the same circuit as far as possible; the lamps for general illumination are hung high, but low enough to avoid sharp contrasts on the ceiling.

N. W. Gifford stated that the author gave five foot-candles as the proper amount of illumination on a reading table. He asked whether this was enough or too much; if there was not a popular tenddency to ask for more light than was necessary. He said that in Boston the matter had been investigated by a commission, considering the question of school

lighting. He believed the figure established was 2.5 foot-candles.

Dr. Bell replied that he was also of the impression that the figure was 2.5, but there seemed to be some doubt in the minds of the physicians as to what was the best figure for school-room illumination.

In closing the discussion Mr. Marks said that there is considerable question as regards the amount of illumination on the reading table. After an investigation covering six months in a New York public library, studying the conditions, the conclusion was reached that 2.5 foot-candles, under average working conditions, was not nearly enough for the readers who frequented the libraries. This is so to a certain extent because of the books being printed in different languages. With some of these the type is exceedingly small. What has been attempted in the installation described in the paper has been to establish a happy mean. A book can be placed in such a position as to get ten foot-candles on any reading table in the library. On the other hand, if the book is held just outside of the edge of the table, it will receive only 2.5 foot-candles.

The paper entitled "Engineering Problems in Illumination," by Alfred A. Wohlauer, was read.

The object of this paper was to present a conception of the duties of the illuminating engineer; to point out and to develop problems which have been solved by him, and to give an idea of the elements and fundamentals an illuminating engineer has to master in order to be able to carry out his work, and then lay down a clear and convincing proof that illuminating engineering is an individual profession.

Albert J. Marshall, in discussing Mr. Wohlauer's paper, called attention to the necessity for giving due consideration to both the utilitarian and æsthetic values in illuminating engineering work.

F. J. McGuire also called attention to the necessity for an illuminating engineer to consider æsthetic values, and not to assume too much importance with regard to the matter of economy of current. He called attention to several instances where the architects had opposed the idea of introducing the services of an illuminating engineer.

Mr. Lansingh directed attention to the fact that prismatic glassware had been developed which would enable the illuminating engineer to secure certain definite results that might be applied to areas of widely differing characteristics.

E. L. Elliott called attention to the large discrepancy which must always take place between theoretical and actual values. In attempting to obtain uniform illumination, for instance, in a store, where it would undoubtedly be desirable, in some cases it would be found in practice that after the engineer had secured, as nearly as could be calculated, a uniform illumination, there would be considerable variance after the lighting had been installed.

The paper entitled "Intrinsic Brightness of Lighting Sources," by J. E. Woodwell, was presented. An abstract of this paper is given elsewhere in this issue.

The discussion on this paper was opened by D. McFarlan Moore, who congratulated the society on taking up the subject of intrinsic brilliancy. He thought that Mr. Woodwell's statement that the intrinsic brightness rather than the distance of the source from the eye is the cause of the contraction of the pupil of the eye, is illustrated in exterior lighting in a remarkable way. He also stated that the theoretical specifications indicated in the paper are only met by the vacuum tube. In this system of lighting the illumination can be regulated over a large degree of brilliancy, but it is generated at the intensity a which it is used.

The paper entitled "Some Experiments on Reflection from Ceiling, Walls and Floor," by V. R. Lansingh and T. W. Rolph, was read.

The tests described in this paper were undertaken to determine the values of the reflection of light from ceiling, walls and floor under average conditions of artificial lighting. The paper described the test room, the lamps and reflectors, the instruments, and the methods of test. The conclusion is reached from these tests that the floor has little value as a reflector. Comparing the values with one lamp and reflector with those with three lamps and reflectors, the effective angle with light ceiling and dark walls and floor is sixty-three degrees in the first case and fifty-six in the second case. The average angle of sixty degrees may be considered as good for the assumed conditions with small rooms.

The paper entitled "Architecture and Illumination," by Emile G. Perrot, was read by the author.

Mr. Perrot holds that the architect's means of expression is by the use of materials of construction which must be so molded and shaped as to give the appearance of solidity; that is, that the building is a concrete reality; that it is solid and substantial in addition to being a thing of beauty. This effect is produced largely by means of shades and shadows. It is here that light plays a most important part in the bringing out of the details which characterize the work of the master architect. The study of the play of light and shade on the exterior of a building requires the highest kind of training for the successful outcome of an architectural composition. With interior lighting a different condition exists; hence the design of details for the interior of a building should not possess the same characteristics as are found on the exterior of buildings. His idea as to the way in which the Illuminating Engineering Society could materially help the architects would be by the publication of tables embodying standards and giving data and formulæ for the lighting of all types of buildings with various illuminants. If buildings are to be properly lighted and made to embody the latest improvements, the architect should be kept in touch with all that is new and desirable for the purpose of effectively and economically lighting the building he designs, with the view of wedding architecture and illumination. He believed this result could better be accomplished through the society than by any other means.

Following the discussion on this paper President Bell thanked the Philadelphia committee for the successful work which had been put into the convention. The total membership registered was 242, and there were visiting the convention 158. It had been especially gratifying to him as presiding officer to see the way in which the members had actually attended the business meetings. Wherever the next convention might be held, the local bodies would have to work hard to maintain the pace set by Philadelphia.

The meeting then stood adjourned.

Convention of the National Society for the Promotion of Industrial Education.

The second annual convention of the National Society for the Promotion of Industrial Education will be held at Atlanta, Ga., November 19, 20 and 21. The headquarters will be at the Piedmont Hotel, where the annual banquet will be held on Thursday evening, November 19. The meetings of the convention will be held at the State Capitol, House of Representatives. The exhibition of work by pupils of the trade schools will be arranged in the corridors of the State Capitol surrounding the House of Representatives.

The Fixation of Atmospheric Nitrogen.

This subject was discussed at the recent International Congress of Applied Electricity, held at Marseilles, France. Mr. Blondin, vice-president of the section for Electrochemistry and Electrometallurgy, described the processes of Kowalski and Mocsicki and of Birkeland and Eyde. The latter process is characterized by the use of alternating-current arcs in the form of discs nearly two metres in diameter. The plant at Nottoden, in Norway, uses this process and consumes 36,000 kilowatts with an output of 500 kilogrammes of NO_3H per kilowatt per year. Mr. Blondin also described the Frank and Caro process used at Notre-Dame-de-Briancon for the manufacture of cyanamide of calcium. The fixation here is effected by the electric effluvium. The frequency used is fifty periods per second. It was stated that according to Birkeland the frequency is not of importance, as he had not obtained any improvement by increasing the periodicity. It would seem that the ionizing action has very little influence, perhaps one in 1,000. Reference was likewise made to the process of Professors Gorbow and Mitkievitch, of St. Petersburg, who employ a high-tension three-phase current with furnaces consuming a maximum of fourteen kilowatts for producing nitrous oxide. The results show a production of 480 kilogrammes per kilowatt-year. The process is not yet applied on an industrial scale. The Pawling process used at Innsbruck was next brought to the attention of the congress. It is based on the system of horn lightning arresters, furnaces of 500 to 700 kilowatts being used, and is characterized by the direct production of thirty-six to forty-degrees Beaumé nitric acid. Researches made by Professor Haber, of Karlsruhe, were also mentioned. He has found that the principle of increasing the output lies in improving the ionizing action of the arc. In order to do this a lowering of the temperature is indispensable, a high temperature being one of the great obstacles to the ionizing influence. Professor Haber has realized the necessary condition by slightly decreasing the pressure and utilizing electrodes of Nernst material. The ionizing action undoubtedly takes place, as a thermic calculation will indicate. The concentration of the oxide, which is five per cent in the Birkeland process, amounted to fourteen per cent in the Haber experiments.—*L'Industrie Electrique* (*Paris*), *September* 25.

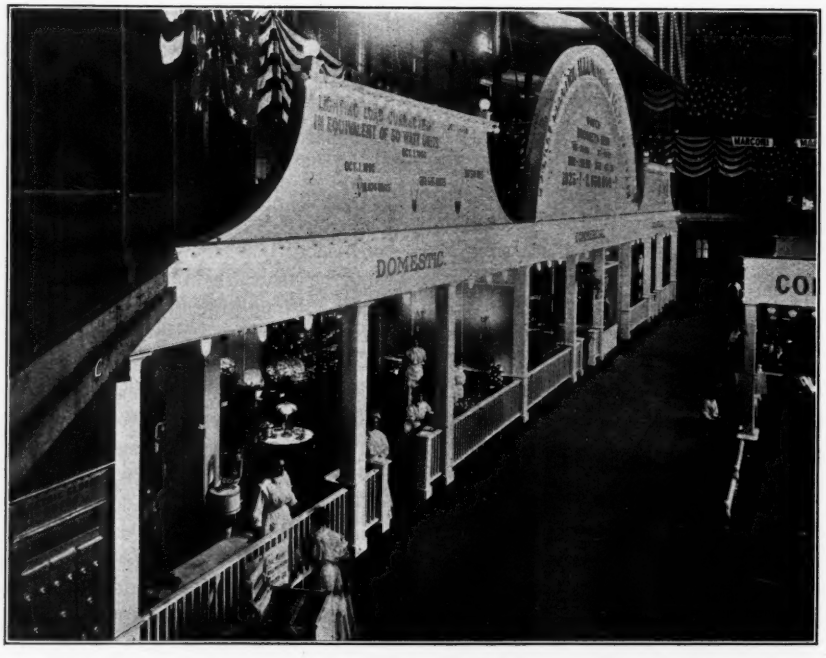
Photographs of the New York Electrical Show.

The accompanying illustrations are interesting as showing the extent to which decorative features were carried and actual demonstration of material made at the New York Electrical Show, which was held at Madison Square Garden recently.

One of the most prominent features of the show was the huge "Brooklyn" sign, spanning the Fourth avenue end of the amphitheatre. The Brooklyn Edison exhibit presented a unique exemplification of the utility of electrical devices and was divided into representations of domestic, commercial and industrial applications. The façade overtopping the booth was made to illustrate the great growth of the Brooklyn Edison system during the last decade.

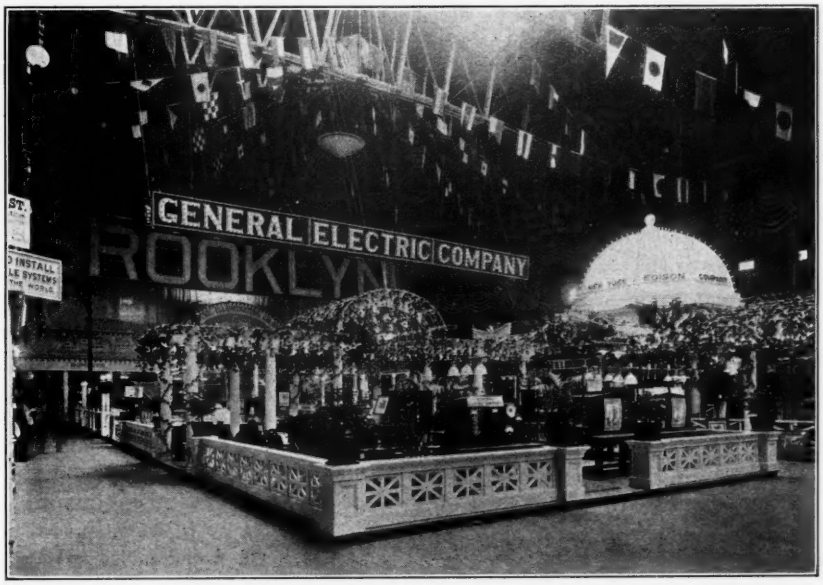
THE BROOKLYN EDISON SIGN AT THE NEW YORK ELECTRICAL SHOW.

Other illustrations show the booth of the General Electric Company, which had one of the most artistic exhibits in the hall. Tungsten and tantalum lamps were the features of this exhibit as well as the principal objects of interest of the entire



THE BROOKLYN EDISON EXHIBIT AT THE NEW YORK ELECTRICAL SHOW.

show. The large space occupied by the company was divided down the centre by a brick-floored pergola covered with vines and illuminated by forty, sixty and 100-watt tungsten lamps in Holophane reflectors. The effective beautiful green and white of the pergola in the brilliant rays of the tungsten lamps was further enhanced by miniature bulbs sparkling in the foliage. On one side of the pergola the company exhibited its complete line of electric heating devices, including the new electric toaster, a valuable adjunct to the electric chafing-dish, the new continuous heat of cigar lighter, and special kitchen outfits and ovens. At this end of the space a comparison was shown of the tungsten and carbon-lamp efficiency by means of the lamp-testing watt-indicators, and the new twenty-five-watt tungsten lamp was exhibited for the first time.



THE GENERAL ELECTRIC COMPANY AT THE NEW YORK ELECTRICAL SHOW.

On the other side of the pergola tables were arranged with brass arches for showing the complete line of tungsten and tantalum lamps, and the new high-efficiency merging-prism Holophanes. A Deshler-McAllister photometer was arranged with a forty-watt tungsten lamp and a thirty-two-candle-power carbon lamp giving practically the same candle-power, and attached to two Thompson induction wattmeters with special rapidly-moving dial trains, so that the different rates of current consumption with equal candle-power were strikingly exhibited. This part of the booth was of particular interest to central station managers and supply dealers who appreciated the suggestion for a window display.

In the centre of the aisle was a direct comparison of one 250-watt tungsten lamp and thirteen sixteen-candle-power carbon lamps giving approximately the same candle-power, with a comparison of relative cost of current consumption per month. The two types of lamps were suspended from opposite ends of a balance arm, and on an arch above were three 250-watt tungstens in Holophane shades, which were exhibited as having approximately the same current consumption as the thirteen sixteen-candle-power carbon lamps below.

One of the most interesting features of the exhibit was a case of miniature tungsten lamps showing the innumerable forms in which it has been perfected by the General Electric Company. There were types suitable for use on automobiles, motor boats, table lamps, vest-pocket lights and practically all forms of low-volt and battery-service lamps were included in the many samples shown. The case was illuminated by fifteen-volt tungsten series sign lamps of four candle-power each.

The General Electric Company also loaned the exhibition company a quantity of tungsten lamps for use in the chandeliers of the Madison Square Garden, this being the first time that the Garden has been so illuminated.

A 6,000-ampere direct-current wattmeter was the head of a line of instruments which extended to the new Type L portable lamp-testing watt indicator, which can be screwed into an ordinary socket and indicates the different watt consumptions of single incandescent lamps. Standard switchboard panels, generator panels, moving-picture machines, mercury arc rectifier panels, automatic compensator panels for alternating-current motors, and miscellaneous rheostats, circuit-breakers, contactors, etc., were displayed to advantage, as well as a small thirty-two-kilowatt Curtis steam-turbine generator set. Two new fifty-hour flaming arc lamps added to the blaze of illuminations surrounding the booth.

The representatives of the company included F. H. Gale, J. O. Case, W. J. Canning, T. Beran, C. E. Estabrook, A. D. Babsom, W. S. Brayton, F. C. Bates, A. D. Page, F. W. Willcox, G. C. Osborn, R. B. Parker, Henry Schroeder and W. C. Andrews, and a large number of visitors from the engineering and sales departments of the Schenectady works, among whom were seen M. P. Rice, C. W. Stone, W. S. Andrews, C. W. Bartlett, F. H. Vaughen, E. M. Hewlett, W. J. Newcomb and W. P. Brown.

The illuminating engineering department of the General Electric Company was represented by W. D'A. Ryan and G. H. Stickney, who used a pair of tungsten diffusers suspended in the pergola and the exhibit of tungsten lamps as texts for many instructive lectures on the new problems being solved in the lighting art.

Light and Power Plant for Twillingate, Newfoundland.

Boston capital has become interested in modernizing the city of Twillingate, Newfoundland, and as the initial and basic step will establish a plant for electric light and power. This will be the third such plant in Newfoundland, and basing opinion on the experience of those already in action, the enterprise is destined to be an exceedingly profitable one for those interested.

The city has a population of above 11,000, within a radius of four miles, and the plant will start with about 6,000 lights, including 500 street lights. The charter of the Twillingate company is direct from the government and covers the entire district, which embraces an area of about forty miles and contains a population of over 72,000.

The plant will consist of two 250-kilowatt steam turbines, it not being considered wise to depend upon the water power at hand. Based upon present contracts the Twillingate company shows a net profit the first year of seventeen per cent on its capital.

The plant is being installed under the supervision of Frederick S. Palmer, 103 Bedford street, Boston, Mass., who is president of the company and who has associated with him several Boston and Newfoundland financiers.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

Electrification of the Melbourne Suburban System.

The Victorian Railway Commissioners, who are responsible for the management of the state railways of Australia, have, for some time past, been considering the advisability of applying electric traction to the Melbourne suburban lines, which form the most important part of the whole railway system. The number of suburban trains in Melbourne forms only 4.5 per cent of the total, while the suburban train mileage forms forty per cent of the total train mileage of the system. The suburban system has some 240 miles of track and 126 stations. For the year ended June 30, 1906, the suburban system had a train mileage of 2,772,669 miles, with 4,080,135 train-miles for the remaining system. The Melbourne suburban railway system is one of the most important in the world, and as the service given at the present time by steam locomotives is very good, the question of changing it requires careful consideration. Charles Merz, consulting engineer to the railway commissioners, has presented an exhaustive report, going into the whole question in great detail. Mr. Merz suggests that the possibility of increased schedule speed is the characteristic feature of electrical operation with a suburban service. To obtain this increased schedule speed, higher acceleration is required. The acceleration at present with steam operation in Melbourne is 0.36 mile per hour per second. By increasing the acceleration to 0.9 mile per hour per second, the time taken for an average run of 0.825 of a mile can be reduced from 147 seconds to 118 seconds. To do this with steam locomotives would not pay, whereas it is easy to obtain a considerably higher acceleration with electric traction. Mr. Merz recommends that normally electric trains should consist of an equal number of motor and trailer coaches. The trains would thus consist of two, four and six coaches, as may be required. For various reasons the three-phase system of operation is not recommended, and it practically comes down to a choice between single-phase system with overhead wires and direct-current system with a protected conductor rail. Further calculations show that the protected conductor-rail system at about 800 volts has many advantages over an unprotected third-rail system at a lower voltage. The adoption of the single-phase system for suburban service has in the past been influenced by the possibility of extending it in the future to long-distance branches. In the case of Melbourne the importance of the suburban traffic preponderates so much that this factor does not enter into account, for the main lines are such that is is doubtful if they will ever need electrifying. After working out in detail the cost of handling the Melbourne traffic with both systems, Mr. Merz finds that the additional cost of the train equipment with the single-phase system would practically balance the extra expenditure on the substations required in the case of the direct-current system. When the annual cost is considered it is found that under the Melbourne conditions the direct-current system shows a saving compared with the single-phase system, so that the latter can not be recommended on financial grounds. The generation and supplying of the necessary power will involve the production of 68,000,000 Board of Trade units per annum, a maximum load of 32,000 to 35,000 horse-power, and an annual expenditure of $500,000.—*Abstracted from Engineering (London), September 25.*

The Trackless Trolley System.

A deputation appointed last July by the Manchester Corporation Tramways Committee, of Manchester, England, to inspect the trackless trolley systems in operation in certain towns in Germany, has presented its report. Among other considerations, it is pointed out how the cost of operating tramways may be divided into running expenses, which remain approximately constant no matter how the total car mileage increases; and standing expenses, which decrease as the number of car-miles per mile of track increases. In illustration of this a table is worked out to show how such expenses increase per car-mile as the number of car-miles per mile of track increases. Taking extreme cases, it is seen that with a figure of $1,900 per mile of single track, with a half-minute service the standing expenses are 0.276 cent per car-mile only; whereas with half-hour service they reach the sum of 16.52 cents. Taking the receipts at twenty-two cents per car-mile, and the running expenses at seventeen cents—that is, the surplus receipts at five cents per car-mile—it would appear from the table that a nine-minute service is the economic limit. The report considers briefly the advantages of tramways for city traffic over mechanically propelled vehicles running independent of rails and independent of a central power station. It is pointed out that the work which a tramcar has to do varies considerably at different periods of the year. In winter, when the track is in bad condition, the tractive effort required reaches its highest point, but this may occur only for a few weeks. It is better and more economical to generate energy to provide for these peak loads in large quantities in a central power station than to provide each separate vehicle with an equipment for generating or for storing its own energy, which may only be called upon for its maximum output a few times a year, but which will have to be carried about by the cars all the year round. The only field for the motor bus is in towns or cities where tramways are not permitted or in suburban districts where the traffic is not sufficiently great to warrant the laying down of tramway rails; and in the latter districts it will have a competitor in the trackless trolley. For providing means of transit beyond the economic tramway limit the trackless trolley system claims consideration. The report describes the three trackless trolley systems inspected by the deputation in Germany. One connects the townships of Monnheim and Langenfeld, near Cologne, and was opened for traffic in 1904, and is two and one-half miles long. The overhead equipment is of the bracket-arm type, and there are two trolley wires. The passenger car is a single-deck vehicle equipped with a twenty-five-horse-power motor, with a front-axle drive by ordinary gear wheels. The car carries thirty passengers. Another line connects the townships of Neuenahr, Ahrweiler and Walsporzheim. This was opened in 1906, and is a little over three miles long. The cars weigh three tons two hundredweight, seating twenty persons. They are driven

from the front axle by a twenty-horse-power motor. The front wheels are rubber-tired, and the back ones are steel-tired. The town of Mulhausen is equipped with the most up-to-date system of trackless trolley. The overhead equipment consists of four trolley lines—two positives and two negatives. This does away with the necessity, when cars are passing, for one of them pulling off the trolley, or eliminates special passing places. The cars weigh fifty hundredweight, and are equipped with one trolley boom, as against the two trolley booms with which the other systems are furnished. The deputation considers that the system, as seen by it in Germany, will require some modification to satisfactorily fulfil English conditions. In reviewing the financial aspect of the matter and making comparison with petrol omnibuses, it is remarked that trackless trolleys would be cheaper to operate than internal-combustion motors. As regards reliability, the report concludes that the commission would have more faith in cars equipped with tramcar motors satisfactorily fulfiling requirements, than in cars equipped with internal-combustion or steam engines as developed at this time. Aesthetic advantages are also pointed out. The corporation, it is understood, will present a bill to the next session of Parliament, asking for powers necessary for equipping and operating a trackless trolley system. In the meantime further observation will be made of the type of car and car equipment best suited to the English requirements.—*Abstracted from Electrical Engineering (London), October* 1.

The St. Clair Tunnel Electrification.

Increase in capacity was the primary object of the electrification of the St. Clair tunnel. Steam locomotives could scarcely clear the summit of the grade leading out of the tunnel with a 700-ton train. The single-phase electric locomotives with which this system is now equipped can take a 1,000-ton train up the two per cent grade at ten miles per hour. The locomotives have also solved the tunnel ventilation problem and removed a serious handicap to the passenger service. They have also made the service better in other respects. For instance, air brakes can now be used on freight trains in the tunnel. Under steam conditions the use of air brakes on freight trains was such a dangerous matter that hand brakes only were used, except on the locomotive. The use of air brakes meant that when a train broke in two on the grade in the tunnel, a portion of the train oscillated back and forth several times before it could be brought to rest with the hand brakes. The danger from the air brakes was due to the fact that the time required to recouple the train and release the brakes exceeded the time the steam locomotive could be kept in the tunnel with safety. The electrification has solved the problem of heavy service, heavy grades and bad ventilation. At Port Huron, the St. Clair River is very deep. The level portion of the tunnel is 100 feet below the level of the yards. The distance from the summit to summit is approximately two and one-quarter miles. Approximately a half mile at each approach is an open cut. The power station is situated on the Port Huron bank of the St. Clair River, at a point almost directly over the tunnel. The building is of concrete construction to the dynamo room floor. The walls above this point are lined with paving block and are corniced and coped with concrete. The roof is of cinder concrete. The walls are lined with enameled brick to the height of the switchboard. The remaining portion is lined with sand lime brick. The offices and switchboard room occupy the street front. The basement has plenty of head room and contains the condenser pump groups and stoker fan groups. The dynamo room floor is so recessed that the auxiliary apparatus in the basement is in view from the dynamo room floor. The boiler room floor is on the same level as the dynamo room basement floor. The power-station equipment is in duplicate, and there are two 1,250-kilowatt, three-phase, twenty-five-cycle, 3,000-volt turbo-generators. Either of these is capable of handling the maximum demand upon the station. The turbines have a large overload capacity, and the boilers have extra large steam drum capacity. The four boilers have a nominal rating of 400 horse-power each, and each boiler has three steam drums. Just outside the power station there is a vertical shaft which extends to the tunnel. A reinforced concrete duct chimney has been built in this shaft as a continuation of the power station duct lines. All the feeders pass from this chimney through holes in the tunnel shell into the tunnel. The locomotive feeders tap the trolley and rail at this point, which is the only distributing point for the entire trolley system. In addition to the locomotive feeders there are two feeders for the tunnel lights, two feeders for the Port Huron portal pump groups, two for the Sarnia portal pump groups, a three-phase power feeder and an arc-light feeder for the Port Huron yards, and similar feeders for the Sarnia yards. These cables are carried through the tunnel in ducts which are supported by reinforced concrete beams and secured to the lining of the tunnel shell. In the yards a single catenary trolley construction is used, while in the tunnel a modification of the catenary construction is employed. There are two parallel messenger cables and two parallel trolley wires. The messenger cables are supported on barrel-shaped insulators spaced at intervals of twelve feet. These messenger cables carry special double trolley hangers, which are also spaced at intervals of twelve feet, but located three feet from the middle of the messenger span. The tunnel is damp throughout a considerable portion of its length, but although the 3,300-volt bare wires are carried within three inches of the cast-iron shell, but two insulators have failed since the electric locomotives were put in operation. The tunnel division is protected by a block signal system which extends from summit to summit. The dispatcher's cabin is located at the Sarnia summit, and the other signal cabin at the Port Huron summit. Telegraph orders are used. In addition to the written order the conductor receives a staff when the train enters the block. The switches and signals are locked until this staff is placed in the instrument at the other end of the block.—*Abstracted from the Electric Journal (Pittsburg), October.*

The Kansas Gas, Water, Electric Light and Street Railway Association.

The eleventh annual meeting of the Kansas Gas, Water, Electric Light and Street Railway Association was held in Pittsburgh, Kas., October 8 and 9.

President C. L. Brown, of Abilene, called the meeting to order at 10 A. M., October 8.

The first order of business was the appointment of the following committees: Nominating Committee—R. C. Johnston, T. J. Huntington and W. E. Sweezey; Resolutions—B. F. Eyer, C. M. Lewis; Time and Place of Meeting—H. A. Almert, W. A. Scothorn; Auditing Committee—J. E. Taylor, W. F. O'Connor.

Officers for the coming year were elected as follows: President, W. A. Scothorn, Hutchinson; secretary and treasurer, James D. Nicholson, Newton.

Wichita was selected as the next place of meeting.

Twenty-one new members were elected and the meeting was the best ever held by the association in point of attendance, programme and entertainment. The theatre party, trolley ride and banquet were well attended and heartily appreciated.

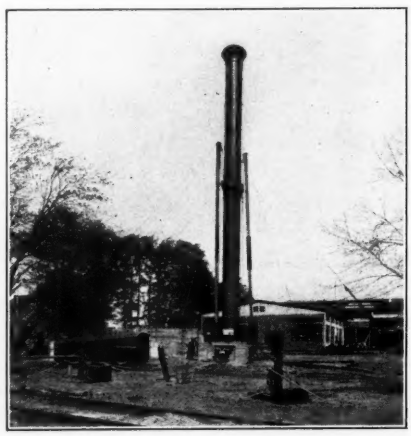
INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

Big Boiler Stack Erected at Ampere.

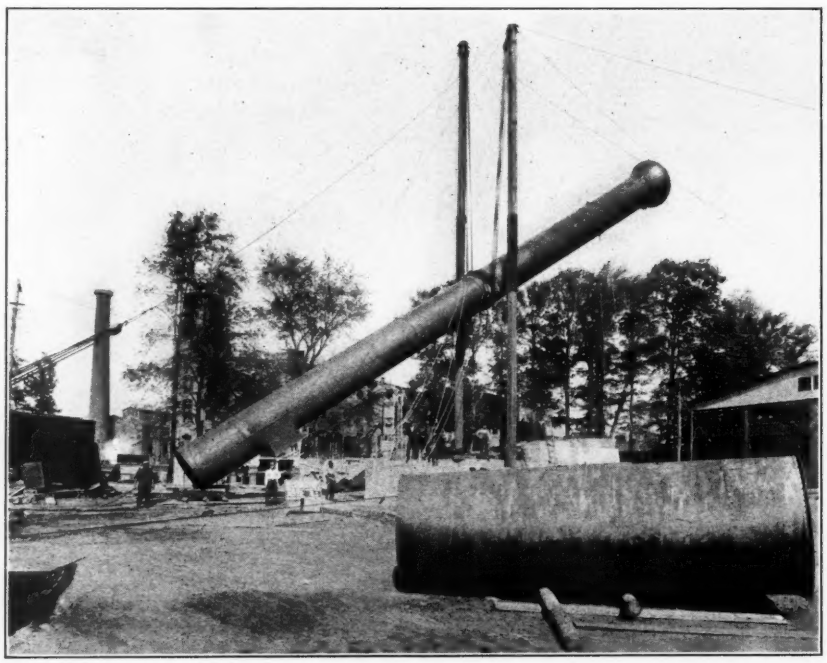
The improvements to the plant of the Crocker-Wheeler Company, of Ampere, N. J., manufacturer of electrical machinery, have reached the stage where work is being started on the new power-house, which when completed will have a capacity of 4,800 boiler horse-power. This entire capacity will not be installed at once. To furnish draft for the boilers temporarily, until the complete plant is installed, the company has erected a steel stack, seventy-two inches in diameter and 105 feet high, standing 125 feet in the air.

This stack will supply natural draft to 800-horse-power water-tube boilers (burning No. 2 buckwheat coal), with an ultimate capacity under artificial draft of 1,600 horse-power. The boilers are of the modern high-pressure water-tube type (steel castings) for generating steam at 200 pounds pressure. The furnaces of the boilers are each nine feet eight inches wide by ten feet deep. The breeching is built of the arched-top and bottom-plate construction to make it self-supporting. The weight of the stack



THE NEW STACK IN POSITION.

and breeching is approximately eighteen to twenty tons and the stack was hoisted into position in one piece, which attests the progress of engineering construction,



HOISTING THE NEW STACK INTO POSITION AT THE GROUNDS OF THE CROCKER-WHEELER COMPANY AT AMPERE, N. J.

connection between the stack and the boilers is six feet wide, and increases in height as it reaches the stack to provide for future installation of boilers.

as this would have been impossible a few years ago. The present stack is to be used temporarily until the further development of the plant, at which time it is contemplated to erect permanent brick chimneys. For that reason the stack is located at present in position to provide for future development until the last boiler installation is made, and is erected on one of the future boiler-setting foundations. This foundation is built of concrete and that portion on which the base of the stack rests is reinforced with steel. The stack connection to the foundation is provided by means of a cast-iron sectional annular ring which is bolted to the foundation and also to the stack.

The stack was designed and erected by the engineering-construction office of Walter Kidde, New York city. It was built by the Dover Boiler Works, of Dover, N. J.

New Type Circuit-Breaker.

Both fuses and circuit-breakers are recommended by the fire insurance underwriters for use with motors because in the smaller installations the circuit breakers are too expensive. For this reason fuses are often used, even though the work of replacing them when blown is excessive. Fuses are in many cases dangerous as well as expensive and

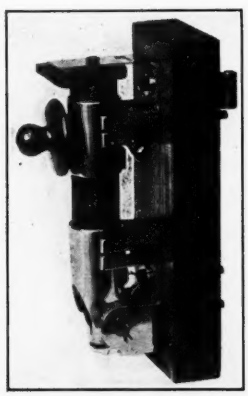


FIG. 1.—CIRCUIT-BREAKER CLOSED.

troublesome to maintain. It is not an infrequent sight to find a blown-out fuse replaced by so heavy a wire that it could burn out only with a current which would severely damage the apparatus it is supposed to protect.

The general use of circuit-breakers has been limited because of the first cost of the installation. In order to provide a

breaker which shall be able to compare in price with enclosed fuses, the Westinghouse Electric and Manufacturing Company has developed a small carbon break-circuit-breaker known as the Type F.

The illustrations show the compact and neat construction of the circuit-breaker, suggesting the appearance of a cartridge fuse. The tripping device is inside the movable arm; it may also be tripped by hand by the small insulating handle shown in Fig. 1. In addition, an auxiliary magnet coil may be attached to provide for tripping the switch from a distance, such as is required in connection with automatic limit switches on machine tools.

These circuit-breakers are made in four sizes for twelve and one-half, twenty-five, and fifty and seventy-five amperes. Each has an operating range of from eighty to one hundred and sixty per cent, that is, the tripping device may be set for any current within these percents of the rated capacity. Adjustment is made by a knurled nut at the lower end of the arm

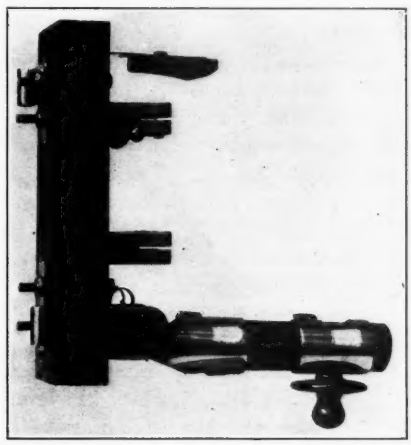


FIG. 2.—CIRCUIT-BREAKER CLOSED.

and may just be seen in Fig. 1. These breakers are made in single-pole types for direct current up to 250 volts and alternating current up to 440 volts, and are approved by the National Board of Fire Underwriters.

The standard circuit-breaker is mounted on a porcelain base, similar to the mounting of a fuse, with all the connections on the face of the porcelain to permit being placed directly on the wall. However, it is also supplied for switchboard and control tablet work where the connections are made on the back; two screws are provided for mounting under these conditions. The outfit as a whole takes up practically no more space than an enclosed fuse of the same capacity.

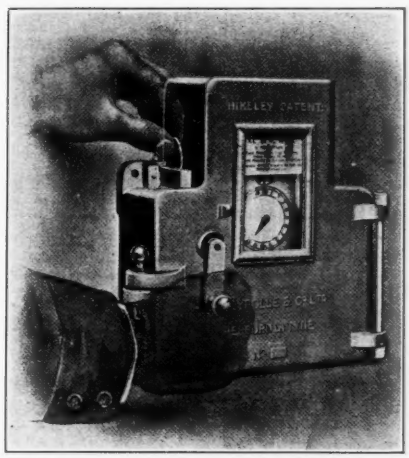
An English Prepayment Electricity Meter.

A method of charging in small installations, where the cost of an ordinary meter is not justified, is coming into use in some places, where the charge is based on the number of hours' use of current, irrespective of the number of lamps that are being fed. This system has met with considerable favor in some parts of Spain, says *Electrical Engineering,* London, and has lately been developed in England in a tentative manner on the mains of the large supply companies in the Northumberland and Durham areas.

It is therefore of interest to give a few details concerning the Hikeley patent meter, which has been especially designed to meet these requirements for installation up to about eight lamps. Briefly, the meter is supplied for use with alternating or direct currents, and is of the prepayment type. The circuit is closed automatically by putting one or more pennies in the slot, and the switches remain closed for a period depending on the number of coins inserted. The standard design is such that for every penny current can be used for five and one-half hours, but the calibration can be altered to suit any other rate.

The general appearance of the meter is shown in the illustration. It consists essentially of a clock with an electrically operated detent, beyond which there is no electrical metering gear about it. The clock operates a large toothed disc seen inside the instrument, tending continually to turn in one direction. If this motion goes on uninterruptedly it will, at the end of the travel, operate a trigger which, on being knocked away, allows the switch on the meter to open. The act of putting in a penny and moving a handle in accordance with the directions given, virtually "puts back the hands of the clock," and gives the tenant a further period before the trigger is operated. The motion is effected by first bringing the outside handle, which engages with a drum slotted to receive the penny, to the upward limit of its path. The penny, on being inserted, acts on a connecting piece between this drum and a toothed wheel, controlled by a spring and engaging with the large toothed disc. On bringing down the outside handle the large disc is thus turned through a position equal to one pennyworth, the penny is then dropped into a cash box, and the small toothed wheel is released from the drum. The position of the pointer on the front dial then shows the number of hours' running which the consumer has in hand before further payment becomes necessary. The slot in the drum is made large enough to allow a halfpenny to fall clear, so that if anyone attempts to defraud the electricity supply, the biter becomes bit.

As in slot machines of all descriptions damage is continually done by the insertion of bent pennies, the opening for the admission of coin just allows a straight full-sized penny to pass. The gauge has, however, a slight upward movement, so that, should a bent penny be inserted and stick, it can be lifted slightly and the penny prized from below. The cash box is sealed separately from the cover of the case, so the man who periodically winds up the clock can not collect the money without breaking the seal. With regard to winding, this in practice is found to be necessary about once a month, as the clock provided runs continuously for a fortnight, and the electrical detent prevents it from working when no current is passing.



THE HIKELEY PREPAYMENT WATTMETER.

The current passes through the winding of the electromagnet, which only allows the clock to run while current passes through it. A current equivalent to one eight-candle-power lamp is sufficient for it to operate the detent. The current then passes to one contact of a double switch, with entirely separate arms, through these two switch arms in series to the terminal block of the meter. It is purely in series on one limb of the lighting circuit, no shunt connection being used. The object of the double-arm switch is to prevent fraud. One obvious way to close the switch of the meter would be for the action of the handle, either upward or on its return journey, to bring the brush down into a contact, but this would allow

a dishonest person to tie the handle in position without placing a penny in the slot. The way in which this is overcome is to have two separate bridge arms, one closed by the upward sweep of the handle, and the other by its return stroke. Moreover, unless the insertion of a penny has in the meantime caused the disc with the tripping device to be rotated, the trip will immediately operate on the downward stroke of the handle, and no current can be obtained. If there is no money "banked" in the machine in the form of hours to run, the back switch will not operate, but it should be noted that the handle of the meter can, if necessary, be used as a main switch, as the operation of the handle without the use of a penny will not move the pointer either backward or forward.

In the illustration it will be noted that the top portion of the window is occupied by a tablet giving instructions as to the working of the meter. The front of the case is hinged and padlocked; if it is swung back there will be seen a set of check dials covered from the consumer's observation by the instruction label, showing the total number of hours that the meter has been working. By comparing the hours run by the money in the cash box the collector can immediately detect theft of money. The electromagnetic detent which holds the balance in such a position that the clock will start again when the detent is withdrawn, can be reached for examination from the back of the meter, which, on being screwed to the meter board, is inaccessible to the consumer. The detent is of peculiar construction, consisting of a thin reed so arranged that, while it yields very easily to the pin on the balance wheel in one direction, it becomes rigid and detains the pin on the return stroke. The detent is withdrawn smoothly on the action of the electromagnet.

The whole design appears to be of strong and substantial construction, and the over-all dimensions of the device are about nine inches by eight and one-half inches, by five and one-half inches. A. Reyrolle & Company have developed Mr. Hikeley's patent, and the device has now been in successful use for about two years.

Electrical Supplies for the Navy Department.

The Bureau of Supplies and Accounts will open bids in Washington, D. C., on November 17, for a large quantity of electrical material for delivery at various yards, under schedule No. 471.

Machine-Tool Controllers.

The self-contained drum-type machine-tool controller illustrated herewith is a recent addition to the line of electric-controlling devices designed for use with motor-operated machine tools.

It possesses the advantage of combining in one compact piece of apparatus the speed-regulating mechanism and the resistance.

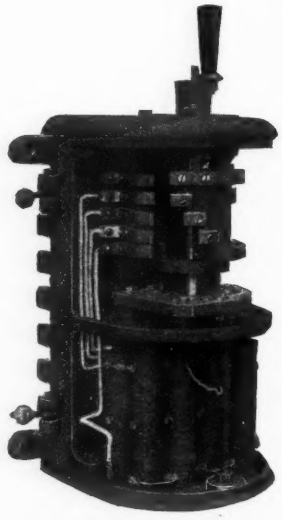


FIG. 1.—FRONT VIEW OF MACHINE-TOOL CONTROLLER.

Fig. 1 is a front view of this new type of controller and shows the removable resistance units mounted in the lower half

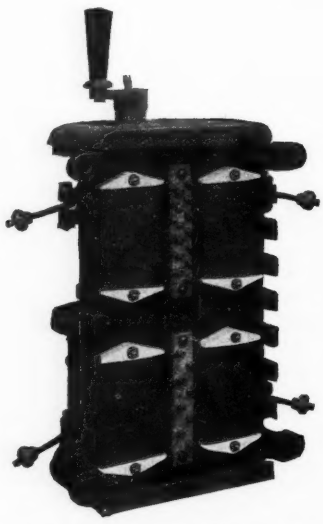


FIG. 2.—REAR VIEW OF MACHINE-TOOL CONTROLLER.

of the controller with insulated wires running from each unit to the metal "fingers" in the upper part of the device. These units constitute the armature resistance and are employed for starting duty only.

Fig. 2 is a rear view of the same drum and shows another type of resistance unit —also removable—mounted on the back of the controller. The four units shown in this view constitute the field-regulating resistance and are divided into twenty steps, providing a range of speed variation of 2 to 1 or 3 to 1.

These controllers are made for both reversible and non-reversible motors ranging from one to seven and one-half horsepower, and are designed for use on either 100 or 220-volt direct-current circuits. They are made by the Cutler-Hammer Manufacturing Company, of Milwaukee.

Electrical Manufacturers at the Street Railway Conventions.

The annual exhibit of the American Street and Interurban Railway Manufacturers' Association, held in conjunction with the conventions, the proceedings of which are reported on other pages of this issue, covered the entire expanse of Young's Million-Dollar Pier, Atlantic City, N. J. At the annual meeting of the Manufacturers' Association, held on Wednesday afternoon, the following members of the executive committee were elected: For the one-year term: K. D. Hequembourg, Walker & Bennett Manufacturing Company; for the three-year term, J. R. Ellicott, Westinghouse Air Brake Company; C. C. Castle, Hildreth Varnish Company; J. H. McGraw, McGraw Publishing Company; W. K. Porter, Electric Service Supplies Company; Cornell S. Hawley, Consolidated Car Heating Company.

The *Electric Railway Journal* published a "Convention Daily," which kept everyone in touch with the proceedings of the various organizations, and formed a complete reference to the exhibits of the manufacturers.

There were nearly two hundred exhibitors of every appliance appertaining to electric railway service, outside of the track exhibits, adjacent to the pier. Among these may be mentioned:

LIST OF EXHIBITS.

The Allis-Chalmers Company, Milwaukee, Wis., showed an operating exhibit of air-brakes and parts, steam turbine parts, pictorial exhibit of other products. Represented by F. C. Randall, J. F. Dixon, H. W. Rowley, Harry Byrne, A. P. Peck, W. G. Clayton, J. T. Cunningham, St. John Chilton, J. B. Nicholson, S. H. Payne, J. M. C. Lucas, A. H. Whiteside, J. R. Jeffrey, J. H. Denton, W. A. Crawford, I. L. Dimm, W. S. Heger.

The American Steel & Wire Company, Chicago, Ill., exhibited bare and insulated wires and cables, rail bonds and rail bond tools, springs, wire rope and strand, woven wire fence, concrete reinforcement. Represented by F. Baackes, C. S. Knight, Jr., G.

A. Cragin, F. A. Keyes, C. R. Sturdevant, R. K. Sheppard, J. D. Sutherland, A. G. Greenberg, R. H. Pratt, B. H. Ryder, G. C. Kiefer, L. A. Dietrich, E. W. Vaughan, Chas. Larson, B. B. Ayers.

The Alfred and J. M. Anderson Manufacturing Company, Boston, Mass., showed its new remote-control oil switch, new brush-holders for heavy railway service, third-rail insulators, Aetna railway insulators and Anderson line materials, new strain insulator of drop-forged steel. Represented by J. M. Anderson, Alfred Anderson, W. W. Hincher, G. C. Crane, Ernst Woltman.

The Blake Signal & Manufacturing Company, Boston, Mass., exhibited Blake despatcher's signals, Blake tube soldering flux, Blake wiring specialties. Represented by E. J. Burke, C. C. Blake.

The Buckeye Engine Company, Salem, Ohio, made its usual exhibit of photographs of steam and gas engines. Represented by C. H. Weeks, A. H. Riddell, James T. Castle.

The Chicago Pneumatic Tool Company, Chicago, Ill., showed a complete line of electric drills, hoists and grinders, spike-driving electric drill, air-compressor, air tools, vacuum cleaners. Represented by W. O. Duntley, Thomas Aldcorn, G. A. Barden, F. C. Severin, W. F. Heacock, Charles Booth, W. P. Pressinger, H. B. Griner, C. B. Coates, Howard Small.

The Consolidated Car Heating Company, Albany, N. Y., exhibited its well-known electric heaters and switches, trolley voltage signal bell system and crossing signal. Represented by Cornell S. Hawley, W. S. Hammond, J. Thomas Farmer, Jr., George H. Diack.

The Crouse-Hinds Company, Syracuse, N. Y., showed its arc headlights, incandescent headlights, mine headlights. Represented by H. B. Crouse, A. F. Hills, F. M. Hawkins, C. M. Crofoot, F. Buchanan, D. C. Gidley.

The D. & W. Fuse Company, Providence, R. I., exhibited enclosed fuses and cutouts of all types for 250, 600 and 2,500-volt circuits, service switch boxes, fuse boxes, cut-out boxes for railway lighting and motor service, railway shoe fuse boxes, transformer and high-tension cutouts, and Deltabeston magnet wire. Represented by W. S. Sisson.

The Joseph Dixon Crucible Company, Jersey City, N. J., had on exhibition a special steel building and made a display of Dixon's Ticonderoga flake graphite oil, lubricants, silica graphite paint. Represented by DeWitt C. Smith, L. H. Snyder, J. A. Condit, John J. Tucker, Thos. Findlay.

Dossert & Company, Inc., New York, N. Y., exhibited solderless cable connectors. Represented by H. B. Logan, C. A. Flynn, D. J. Fitch.

The Electric Service Supplies Company, Philadelphia, Pa., exhibited its new "Pay-Within" car, "Protected" rail bonds, Keystone overhead line material, Garton-Daniels lightning arresters, automotoneers, Lyon sheet steel gear cases, Keystone air sander trap, Keystone pneumatic bell ringer, Keystone lamp guard, pneumatic door operating mechanism, compressed air door operating mechanism. Represented by C. J. Mayer, J. W. Porter, J. V. E. Titus, A. H. Englund, M. A. Berg, E. R. Mason, F. H. Jameson, H. G. Lewis, Edw. Hammett, H. R. Swartley, Jr., W. A. Armstrong, Jr., T. F. McKenna, F. A. Strail, R. P. H. Staub, F. C. Peck.

The Electric Storage Battery Company, Philadelphia, Pa., exhibited several styles of samples of the "Chloride" accumulator, diagrams of the new split-pole rotary converter, used for regulation of alternating-current loads, curves showing the regulation, and an average adjuster. Represented by Charles Blizzard, J. L. Woodbridge, G. H. Atkin, Albert Taylor, H. B. Gay, Edward L. Reynolds.

General Electric Company, Schenectady, N. Y., showed its type M automatic control for four seventy-five-horse-power motors, US-13 trolley base with twelve-foot trolley pole and Form 21 fork with wheel, trolley forks and wheels for various speeds, MR12 circuit-breaker, MS-8 switch, K-35, K-36, K-34 controllers with handles, fuse boxes, contactors, switchboard panel for Type M control, car light regulator, emergency straight air-brake equipment with compressor for motor car, emergency straight air-brake equipment for trailer car mounted on rack for operation, motorman's valves, emergency valve, governor, split, solid and forged rim gears, cast-steel center for gears, armature and field coils commutator segments, armature linings for GE-216 motor, Grade F pinion, section of field coil showing effect of vacuum compound treatment, 600 1200-volt railway motor, rail bonds, catenary and standard direct suspension line material, electrolytic car lighting arresters, Magnetite headlights, self-contained solenoid-operated circuit breaker arranged for 650-volt operation, alternating current and direct current, rotary converter panels. Represented by C. E. Sprague, C. C. Peirce, J. J. Mahoney, H. D. Hawks, W. J. Clark, R. E. Moore, E. H. Ginn, H. C. Marsh, W. J. Hanley, H. L. Monroe, G. D. Rosenthal, Gen. Irving Hale, J. R. Lovejoy, J. G. Barry, C. E. Barry, H. N. Ransom, W. B. Potter, F. E. Case, E. D. Priest, A. H. Armstrong, E. H. Anderson, G. H. Hill, A. V. Thompson, F. H. Gale, Mr. Corbin, Mr. Buell.

The General Storage Company, Boonton, N. J., exhibited storage battery plates, jars, tanks and accessories in various sizes, "Bijur" regulator and switchboard. Represented by Joseph Bijur, James Dixon, Edward Lyndon.

G. M. Gest, New York, N. Y., exhibited cable racks, conduit and photographs of typical installations.

The Gold Car Heating and Lighting Company, New York, N. Y., showed the Gold improved electric car heaters, junction boxes and parts. Represented by E. E. Gold, E. B. Wilson, J. M. Stayman, F. T. Kitchen, F. Cahill.

The Gould Storage Battery Company, New York, N. Y., exhibited various types of Gould cells, lead-lined tanks. Represented by H. N. Powers, C. H. Bradley, H. W. Brow.

The H. W. Johns-Manville Company, New York, N. Y., exhibited high-tension catenary overhead line material, asbestos wood, indurated fibre third-rail insulators, battery jars, low-tension overhead line material, arc deflectors, high-tension porcelain insulators, Noark enclosed fuses, molded mica sockets, friction tape, splicing compound, electric car heaters, asbestos pipe and boiler covering, asbestos roofing and packing. Represented by T. F. Manville, J. W. Perry, T. L. Barnes, S. G. Meek, E. E. Schmid, J. McSorley, C. N. Manfred, H. M. Voorhis, G. A. Saylor, H. M. Frantz, R. R. Braggins, W. W. Power, C. W. Schultz, E. B. Hatch, W. H. Kempton.

The Lord Electric Company, New York, N. Y., exhibited Earll trolley retrievers and catchers, Thomas laminated soldered rail bonds, Shaw lightning arresters, Cosper controlators, Garton choke coils, Garton "Multi-Vapo-Gap" lightning arrester, cell and block type, Garton "Hydro Ground," Leco ground plates, points, cap and couplings, Leco car seat heat deflectors. Represented by F. Lord, E. Kirkham, W. R. Garton, E. A. Robertson, Ray P. Lee, C. A. Davis, W. P. Cosper.

The Massachusetts Chemical Company, Walpole, Mass., exhibited samples of Armalac, Enamelac, M. C. paint, insulating tapes, splicing compounds, Walpole insulating board, field coil cushions, motor bushings, switch board matting car steps, corrugated matting. Represented by L. O. Duclos, A. E. Duclos, F. J. Gleason, E. W. Furbush.

The Elmer P. Morris Company, New York, N. Y., exhibited line material, car trimmings and general repair parts. Represented by Elmer P. Morris, Dwight E. Morris, Fred W. Roth, H. S. Tonks.

The National Carbon Company, Cleveland, Ohio, exhibited a vibrating machine for testing carbon brushes. Represented by N. C. Cotabish, F. D. Kathe, O. T. Weaver, W. B. Brady, A. E. Carrier, A. C. Henry.

The Ohio Brass Company, Mansfield, Ohio, exhibited trolley hangers and ears, rail bonds, third-rail insulators, catenary materials, high-tension porcelain insulators, Tomlinson car couplers, Universal sander valves and traps, Collin steam pressure regulating valves. Represented by C. K. King, A. L. Wilkinson, G. A. Mead, E. F. Wickwire, A. L. Price, C. H. Tomlinson, N. M. Garland, R. M. Campbell, Nathan Shute, W. H. Bloss, F. E. Johnson, E. C. Brown, J. E. Slimp.

The Rail Joint Company, New York City, exhibited samples of rail joints. Represented by B. M. Barr, D. J. Evans, C. A. Cool, G. W. Smith.

The Speer Carbon Company, St. Marys, Pa., exhibited carbon brushes for motors and generators, circuit-breaker carbons. Represented by J. S. Speer, G. P. Fryling.

The Standard Paint Company, New York City, established a comfortable reception room. Represented by J. G. Satterthwait, Paul J. McCarley, Charles E. Smith.

The Standard Underground Cable Company, Pittsburg, Pa., exhibited cables, wires, junction boxes, cable terminals. Represented by H. P. Kimball, T. E. Hughes, C. W. Davis.

The Standard Varnish Company, New York, N. Y., exhibited samples of insulating specialties. Represented by L. Robinson, H. Chilcote, A. Steinberg, E. A. Holland.

The Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., exhibited magneto despatching telephones, central energy despatching telephones and kindred equipments. Telegraph signals manufactured by Telegraph Signal Company, Rochester, N. Y. Represented by J. O. Oliver, H. W. Lucia, E. O. Munson, H. C. Slemin.

The Wagner Electric Manufacturing Company, St. Louis, Mo., exhibited single-phase and polyphase motors, switchboard and portable instruments. Represented by W. Robbins, E. W. Goldschmidt, John Mustard, Brooks Faxton.

The Western Electric Company, Chicago, Ill., exhibited overhead material, pole brackets, armature and field coils, commutators, arc lamps, safety strain insulators, high-tension and third-rail insulators, Kalamazoo trolley wheels, headlights, Deltabeston coils and wire. Represented by A. E. Meixell, H. M. Post, F. Killion, M. A. Oberlander, R. Roth, F. C. Jaeger, R. H. Harper.

The Westinghouse Electric and Manufacturing Company, Pittsburg, Pa., exhibited standard direct current forty-horse-power motors, direct current fifty-horse-power interpole motor, 150-horse-power motor, unit switch system of control for use on direct-current and alternating-current railways, single-phase motors. Represented by J. A. Brett, W. N. Conwell, C. S. Cook, Thomas Cooper, C. H. Davis, H. P. Davis, T. W. Ewing, G. B. Griffin, W. M. McFarland, L. N. Reed, C. W. Register, H. C. Stier, C. B. Humphrey, J. C. McQuiston.

The Westinghouse Machine Company, East Pittsburg, Pa. Represented by E. H. Sniffin, L. L. Brinsmade, L. C. Bullington, H. H. Van Blarcom, J. H. Wagenhorst, R. E. Adreon, G. M. Bates.

The Westinghouse Traction Brake Company, Pittsburg, Pa., had an operating exhibit of equipments suitable for single motor car, two car trains consisting of motor and trailer, and three to five car trains; sectional motor-driven compressor; sectional brake cylinder with slack adjuster. Represented by A. L. Humphrey, J. R. Ellicott, C. R. Ellicott, E. L. Adreon, S. D. Hutchins, P. H. Donovan, Robert Burgess, A. Johnson, C. P. Cass, C. W. Townsend, E. A. Craig, F. M. Nellis, F. V. Green, C. J. Olmstead, A. Johnson, W. V. Turner, J. F. Miller and W. S. Bartholomew.

Current Electrical News

DOMESTIC AND EXPORT.

VIRGINIA WATER-POWER DEVELOPMENT—The Talley's Falls Improvement Company, M. R. Lewis engineer-in-charge, is planning the development of the water power of Talley's Falls, on Dan River, five miles from Scottsburg, Va. From 10,000 to 12,000 horse-power will be available for transmission to manufacturing plants in Virginia and North Carolina, including copper-mining properties in the Virginia-Carolina copper belt. Reports state that $1,000,000 will be the cost of the dam, electric plant and transmission lines.

$1,000,000 BONDS ISSUED BY MILWAUKEE ELECTRIC RAILWAY AND LIGHT COMPANY—Spencer Trask & Company and N. W. Harris & Company, of New York, have purchased jointly $1,000,000 Milwaukee Electric Railway and Light Company refunding four and one-half per cent bonds, due 1931. These bonds are being issued by the company to refund a like amount of Milwaukee City Railway fives, due December 1, 1908. The refunding four and one-half per cent bonds are being offered to investors at ninety-five and interest.

TO HAUL ORE BY ELECTRICITY—An effort is being made by the Arizona Mercantile, Transportation and Smelter Company, of Leavenworth, Kan., to obtain a concession from the Mexican Government for the construction of a standard-gauge electric railroad from some point on the Southern Pacific Railroad in Arizona, probably Maricopa, to the Gulf of California at St. George's Bay, cutting the distance from Central Arizona points to deep water a distance of 160 miles. It is proposed by means of this road to haul ore from the mines to deep water.

DES MOINES ELECTRIC COMPANY TO ENLARGE PLANT—Plans for the extension of its plant involving the expenditure of $1,000,000 have been announced by General Manager Paul B. Sawyer, of the Des Moines Edison Light Company, Des Moines, Iowa, hereafter to be known as the Des Moines Electric Company. This announcement comes as a culmination of recent changes in the incorporation of that concern, as announced recently. While the authorized capital stock of the new company is $5,000,000, the stock actually issued is exactly the amount of the Des Moines Edison Light Company stock outstanding, or $1,125,000. The remaining stock not issued is to provide in part the funds for the future growth of the company. The bonds issued at this time are of such amount as is needed to take up the outstanding indebtedness of the old Des Moines Edison Light Company, $730,000, and to pay in addition for improvements already in progress and contemplated for the year 1908.

NEW MONTANA POWER PLANT TO SUPPLY POWER TO MINES—Between $2,500,000 and $3,000,000 is to be expended in the construction of a new power line from Thompson, Mont., to the Murray district. This project has been in the hands of Senator Donlan, of Missoula, Mont., for some time and arrangements for financing has been completed. Construction work will soon be commenced. The plant will furnish power to the northside mines. From Thompson to Murray the line will be approximately thirty-one miles in length, the right of way having all been secured. Engineers estimate that even in the driest seasons no less than 29,000 horsepower will be generated, 18,000 above Thompson Falls and 11,000 below. The right of way runs west to Mullan and Wallace. One branch goes to Burke and another down Pritchard Gulch to Pritchard Creek will furnish power to Paragon, Chicago-London, Jewell-Jewell, Black Horse, Bear Top, Golden Chest, Terrible Edith, Pilot and many other properties.

NEW HAVEN TRACTION DEAL—According to a statement made by Vice-President E. G. Buckland, the New York, New Haven & Hartford Railroad is planning a $22,000,000 deal in Rhode Island. The New Haven plans to secure control of the United Traction and Electric Company, which has $8,000,000 capital stock and $9,000,000 of five per cent bonds. Included in the deal is the purchase of $5,000,000 four per cent bonds of the Rhode Island Suburban Railway Company. The United Traction and Electric Company owns all the lines in Providence and Pawtucket and their suburbs. Under the present arrangement the New Haven road has only the right to operate these lines. For this privilege it pays five per cent on the United company's capital stock, or $400,000 a year rental. In keeping with its policy the New Haven road wishes to acquire ownership of these lines. The New Haven plan is to give five per cent guaranteed bonds of the New Haven company and to exchange the bonds on a similar basis.

CHICAGO CITY RAILWAY TO BUY ELECTRICITY FROM COMMONWEALTH EDISON COMPANY—A contract by which the Chicago City Railway Company will abandon its power-producing stations and for the next ten years purchase all of its electric power from the Commonwealth Edison Company is ready for approval by the board of supervising engineers. The supervising engineers have already expressed themselves in favor of the contract, but it will be published and distributed before being approved. The contract will be the largest ever made in Chicago for electricity. At the beginning of the term, according to Samuel Insull, president of the Commonwealth Edison Company, it will cost the railway $800,000 or $900,000 annually, and at the end between $1,300,000 and $1,400,000 each year. At the present the street-car company secures slightly less than three-fourths of its motive power from the same company under a less favorable five-year contract. The street-car company will retain its transforming stations.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY TAKES WESTERN ELECTRIC STOCK—The American Telephone and Telegraph Company has arranged to pay for approximately 30,000 shares of Western Electric Company stock, purchased last January, with its four per cent convertible bonds. The transaction involved an exchange of nearly $7,000,000 of the bonds for the shares of the Western Electric Company. The exchange was made through the Merchants' Loan and Trust Company of Chicago. The terms of the offer made by the American Telephone Company to purchase all or any part of the Western Electric Company's stock not then owned by the former corporation were $250 in bonds or $225 in cash for each share, par value $100, of the latter concern's stock. Nearly $3,000,000 of the stock was deposited and this has been paid for in bonds where the amount of stock deposited included more than four shares. The American Telephone and Telegraph Company now controls approximately $12,000,000 of the Western Electric Company's $15,000,000 capital stock.

PHILADELPHIA RAPID TRANSIT LOAN—All interests of the Union Traction Company, of Philadelphia, Pa., which is leased to the Philadelphia Rapid Transit Company, have agreed upon a plan by which a board of directors satisfactory to all is to be elected at a special meeting of stockholders to be held on October 29, and the $5,000,000 loan of the Rapid Transit company is assured. To take the place of the directors who resigned because they held similar positions on the Rapid Transit company's board of directors, the following stockholders have been selected: William P. Datz, Jacob Disston, G. H. Chestnut, Henry Fernberger and E. M. Story. They will take the places to be vacated by the resignations of P. A. B. Widener, George D. Widener, John B. Parsons, George H. Earle, Jr., and William H. Shelmerdine. Jeremiah J. Sullivan's resignation will not be accepted, it has been mutually agreed, and he will be elected vice-president of the reorganized board. Robert A. Balfour, admitted to be the largest shareholder, is slated for the presidency to succeed Mr. Parsons. It has not been decided whether a secretary will be elected to succeed Charles O. Kruger, second vice-president and general manager of the Rapid Transit Company, but this will probably be done. The Balfour committee has sent out letters to stockholders asking for proxies for the directors named and urging each shareholder to vote for the plan by which the Rapid Transit company can pledge securities owned by the Union Traction Company for the proposed $5,000,000 bond issue.

ELECTRIC LIGHTING.

WOONSOCKET, R. I.—The Woonsocket Electric Machine and Power Company has been granted a right of way by the selectmen for its poles and wires.

MALVERN, IOWA—The Malvern Light, Power and Heating Company has begun preparations for stringing nine miles of wire from here to Tabor to carry current for lighting that town.

UNION, MO.—At a special election W. W. McCurdy was granted an electric light franchise by a vote of 111 to 1. The plant is to be in operation by April 6, 1909, when the Tibbe franchise expires.

AUBURN, N. Y.—The contract for building the new plant for the Auburn Light, Heat and Power Company, to occupy the present site of the old building in North street, has been awarded to Charles S. Keim.

SAN BERNARDINO, CAL.—The county supervisors have sold a franchise for many miles of electric power and lighting lines in the eastern section of the valley to the Home Gas and Electric Company, of Redlands.

SAFFORD, ARIZ.—M. E. Webster, formerly local manager of the Consolidated Telephone, Telegraph and Electric Company, is considering a proposition to give Safford and Thatcher an electric lighting and power system.

TAUNTON, MASS.—At a meeting of the county commissioners it was voted to advertise for a loan of $100,000 for the Fall River & Somerset Bridge. Walter H. Law was instructed to draw plans for the electric plant to operate the bridge.

WILLIAMSON, N. Y.—The town board has entered into a contract with the Sodus Electric Light Company to light the streets of this village with seventy incandescent lights of sixteen candle-power each for five years at a cost of $1,000 a year.

GOUVERNEUR, N. Y.—Alexander B. Clark and C. P. McAllaster, of Oxbow, are interested in a scheme to procure power for electric lighting purposes from Bullhead Lake, about two miles from that village. An engineer has surveyed the route.

HEBER, ARK.—An effort is now being made to establish an electric light plant. A corporation will be organized for the purpose of establishing and operating such a plant under the franchise granted W. H. Horton by the city council several months ago.

PURCELLVILLE, VA.—W. Warrington Evans, of Evans & Evans, Washington, D. C., has puchased the Purcellville Canning Factory building at $6,000, which he will equip as an electrical plant and furnish Purcellville, Round Hill, Hamilton and Bluemont with electricity.

NEW HAVEN, CT.—Plans are being perfected for the supplying of the whole of Yale University, including the dormitories, with electric light and power, derived probably from a new central plant. Estimates of the cost of the work, made some time ago, fix the expense at about $60,000.

WASHBURN, WIS.—The city has returned to the Washburn Electric Light and Power Company the lighting plant which was purchased last November. The city has run the plant for almost a year and found it a losing proposition. The lighting company will resume the conduct of the plant.

LEWISBURG, TENN.—A company, recently organized here, known as the Lewisburg Light and Power Company, has purchased the city electric light plant and will assume charge at once. It will greatly improve the system and service, and will establish, in connection, an ice factory and cold-storage plant.

EDMONDS, WASH.—A $20,000 electric light plant is to be built here by local capital. The first unit, with a capacity of 1,500 lights, will be in operation in sixty days. The Edmonds Electric Light and Power Company has been organized for this purpose, backed by C. Malmo, of Seattle; W. R. Ammon, of Prosser, and A. G. Pike, of Edmonds.

LOCKPORT, N. Y.—A new board of directors was elected at the annual meeting of the Niagara, Lockport & Ontario Power Company as follows: H. H. Westinghouse, George C. Smith, Paul T. Brady and Charles A. Terry, of New York city; William M. Clement and William H. Gratwick, of Buffalo, and H. D. Uptegraff, of Pittsburg, Pa.

NEW YORK, N. Y.—Plans have been filed for a one-story electric light station to be built on Blackwell's Island to supply light to the island institutions under the supervision of the commissioner of charities. It is to have a frontage of thirty-one feet and a depth of fifty-six feet and will be built of Greenwich green stone set in broken bond. It is to cost $5,000, according to the estimate of Raymond F. Almirall, architect for the city.

NATCHEZ, MISS.—Lynn H. Dinkens, the purchaser of the Southern Light and Traction Company local plants, comprising the electric light and gas plants, and six miles of electric street railway, sold by order of the court on account of a writ of ouster, the company having been declared a trust, has transferred the entire holdings to the Louisiana Railway Company. The consideration is said to be $5,000 cash, $40,650 stock, and the assumption of a $335,000 mortgage. The new company is domiciled in New Orleans.

WASHINGTON, D. C.—The Navy Department is planning several important improvements and changes in the navy yards at Boston and Portsmouth. At Boston it is proposed to install new electric generating machinery, which will materially increase the capacity of the power plant. This improvement will cost probably $50,000. This improvement will be in addition to the installation of generating machinery and boilers, which is going on at Boston under contract. Bids for the contemplated work will be advertised for in a short time.

LOUISVILLE, KY.—The so-called Fetter electric lighting franchise, carrying with it the privilege to sell electric light in the heart of the city, has been sold at public auction to George G. Fetter, the only bidder, for $5,515. This ordinance was sold six weeks ago to Hardy Burton for $45,515. Mr. Burton failed to pay his money over in the stated time, claiming that the title to the franchise was not perfect. The board of works decided that the Court of Appeals had definitely decided the franchise valid. The board, therefore, forfeited the $2,000 put up by Mr. Burton.

PENDLETON, ORE.—An electric light company has been organized to furnish light for Hermiston, Echo and Umatilla. Work has been started on two power ditches west of Hermiston. The drainage of water from the government and two private reclamation projects will be utilized to develop 500 horse-power. The water will be turned back into the river so as not to interfere with other projects. J. T. Hinkle, a member of the company, says two plants will be in operation before next summer. Other members of the firm are: O. D. Teal, H. G. and Ross Newport.

TOWER CITY, PA.—The Sterling Electric Light Company is pushing work on its plant located at Williamstown. The brick building, which is 150 feet by 60 feet, is almost completed. The boiler and machinery are being placed and the company hopes to begin operations by January 1. The plant is owner principally by Tower City capitalists. It was located at Williamstown, as the town is central, having the towns of Lykens and Wiconisco on one side, with Tower City, Reinerton, Orwin and Reiner City on the east. The company expects to operate its plant during the day.

NAPA, CAL.—The supervisors of Napa County have advertised for bids for a franchise to conduct a farmers' power line from Napa into Lake County, through the Napa Valley. The bids will be opened on November 11. E. D. N. Lehe, of Woodland, is promoting the system and will bid for the franchise. He proposes to supply power not only for electric lights but for pumping water, churning, and even milking cows. The system has been tried elsewhere in this state and has proven practicable and economical for farms and rural communities. Yountville, Oakville and Rutherford are among the towns above Napa which will be reached by the new system.

SYRACUSE, N. Y.—The stockholders of the Syracuse Lighting Company at their annual meeting elected the following directors: Stephen Peabody, New York; Henry Sullivan, New York; Walton Clark, Philadelphia; Lewis Little, George S. Philler, Philadelphia; W. S. Douthirt, Philadelphia; John J. Cummins, Syracuse; Hendrick S. Holden, Syracuse, and Lewis L. Walters, Syracuse. At a subsequent meeting of the directors these officers were elected; President, John J. Cummins; vice-president, Walton Clark; vice-president, J. C. Delong; secretary, W. F. Douthirt; treasurer, Lewis Lillie. President Cummins stated that only routine business was transacted.

ELECTRIC RAILWAYS.

GRAND FORKS, N. D.—The newly organized street railway company of Grand Forks has let the contract for the laying of steel to P. R. McDonnell, of Duluth.

PHELPS, N. Y.—The Phelps board of trustees at its meeting has voted to extend the franchise of the proposed Geneva, Phelps & Newark Electric Railroad another year.

SUFFERN, N. Y.—The board of trustees of Suffern has granted a franchise to the Rockland Railroad Company. This is the New Jersey corporation that proposes to build a road from Paterson to Suffern.

BOSTON, MASS.—The railroad commission has approved of an issue of $150,000 twenty-year five per cent bonds by the Norfolk & Bristol Street Railway for retiring indebtedness in construction of railway.

ELGIN, ILL.—The Elgin, Woodstock & Lake Geneva Railroad has awarded the contract for the surveying and grading of the roadbed to George H. Painter & Company, Chicago contractors. Work will begin immediately.

LONG BRANCH, N. J.—The Atlantic Coast Electric Railway Company, which operates a trolley line between Pleasure Bay and Asbury Park has been granted a twenty-year franchise to run a line between Pleasure Bay and Monmouth Beach.

LEBANON, PA.—A meeting of those interested in the projected street railway which is to extend from Campbelltown to Bismarck, Cornwall and Schaefferstown was held in Lebanon when a temporary organization was effected and steps taken toward the selection of permanent officers.

BAKERSFIELD, CAL.—Captain Cross, of Los Angeles, has issued orders to resume the survey at the Tejon ranch, in this county for the Los Angeles-San Francisco electric short line. The survey already is made from Los Angeles to Tejon ranch and the right of way through the forest reserve has been granted.

HATTIESBURG, MISS.—Officials of the Hattiesburg Traction Company, which controls the street railway franchise in Hattiesburg, announce that they have perfected arrangements for the financing of the enterprise, involving the placing of $250,000 bonds, and work on the plant will commence December 1.

ATLANTIC CITY, N. J.—In bankruptcy for more than a year, the Atlantic City and Suburban Traction Company, operating a line from the Boardwalk here to Absecon and Somers Point, and one time designated to afford an entrance to the resort for a $20,000,000 electric line from Philadelphia, will be sold under the hammer on October 31.

TERRE HAUTE, IND.—Providing for the protection of stockholders and creditors of the Terre Haute & Merom Traction Company, men interested in the enterprise have organized a new corporation with a capital stock of $50,000. Plans for the reorganization of the company were approved and it was decided to go ahead with the construction of the line from Terre Haute to Merom.

SEATTLE, WASH.—A franchise over twelve miles of the county road to Bothell has been granted by the board of county commissioners to the Seattle, Snohomish & Everett Railroad. The road is to be built within five years. The officers of the company are: President, Clyde C. Chittenden; vice-president, J. R. McLaughlin; secretary, treasurer and general manager, C. W. Kimball. The capital stock is $300,000.

SULLIVAN, ILL.—President Starbuck, of the Decatur, Sullivan & Mattoon Interurban, has returned from New York where he went to secure the funds for building this road, which will extend from Decatur to Mattoon. The route has been surveyed, and the right of way and franchises secured. The proposed route will cover forty-two miles. It is expected it will cost $1,000,000 to build and equip the road.

CAIRO, ILL.—A charter for the Cairo & East St. Louis Railway Company has been filed. The charter provides for the building of an interurban railway between Cairo and East St. Louis. The principal office is to be located in Cairo and the capital stock is named as $100,000 with William P. McKinley, L. E. Fisher, George M. Mattis, W. H. Carnahan and George W. Burton as the incorporators and first board of directors.

ST. PAUL, MINN.—The Twin City Rapid Transit Company announces that it will be ready to connect its St. Paul & Minneapolis lines with Fort Snelling as soon as the new bridge over the Mississippi is completed. This work is scheduled to end about March. The new line, which touches Minnehaha Falls, Fort Snelling and one of the most beautiful stretches of the upper Mississippi, will be featured as the scenic route between the Twin Cities.

GALESBURG, ILL.—The new Galesburg, Aledo and Northwestern interurban line will be built in three sections from Galesburg to Alexis or to Rock Island or to Muscatine, according to plans outlined by the promoters at a meeting held in Galesburg. It is proposed to raise $300,000 and build the first section of the line to Alexis. When this stretch is completed and the line is in operation it is proposed to increase the capital stock and take up the construction of the second section of the road.

SHELBYVILLE, ILL.—Engineer A. M. Fisher, Attorney R. T. Eddy, of this city, and John C. Bitzer, of Tower Hill, are engaged in securing right of way between Shelbyville and Pana for the proposed interurban line of the Mattoon, Shelbyville, Pana & Hillsboro Traction Company, and are meeting with success. Mr. Fisher is authority for the statement that G. Cooper, an Indianapolis traction magnate, has secured the pledge of European capitalists to build the road at once, providing the right of way is secured.

ALBANY, N. Y.—The Public Service Commission, Second District, has authorized the Buffalo, Lockport & Rochester Railway Company to issue $200,000 bonds for the acquisition of cars. The cars are to be purchased by the Buffalo, Lockport & Rochester Rolling Stock Company, which will execute a $200,000 mortgage to secure the bonds. The Rolling Stock Company then proposes to sell the cars to the Buffalo, Lockport & Rochester Railway Company upon its agreement to pay ten equal payments of $20,000 each with five per cent interest.

SEATTLE, WASH.—The transfer of the Seattle & Everett Interurban Street Railway system from Fred E. Sander and associates to the Stone & Webster interests, of Boston, is to be followed by the construction of a complete across-the-state electric interurban system. The southern terminus will be Portland, Ore., and the line will reach Vancouver, British Columbia, on the north. A contract is also to be awarded in the near future to build that section of the road between Tacoma and Olympia. The route from the state capital to the Grays Harbor country has been surveyed and the surveyors are now working south from Aberdeen to Portland.

SYRACUSE, N. Y.—Buffalo and Rochester were connected by trolley for the first time on October 2, and with the opening of regular traffic over the new Buffalo, Lockport & Rochester electric lines in a few weeks it will be possible to go from this city to Buffalo by trolley, by way of the Auburn & Syracuse, Rochester, Syracuse & Eastern and the new road. Upon the completion of the proposed extension of the Rochester & Eastern from Port Byron to this city, a trip with but one change, at Rochester, will be possible between the two cities. At the offices of the Beebe syndicate it is stated that the work of extension from Port Byron here will be begun early in the spring. It will require twenty-five miles of double-tracking and will cost $1,250,000, estimated. The Beebe interests are at present directing all efforts toward the completion of the Fulton & Oswego extension of the Lake Shore & Northern road.

DATES AHEAD.

American Electrochemical Society. Fall meeting, New York city, October 30-31.

Association of Car-Lighting Engineers. First annual meeting, Chicago, Ill., November 18.

National Society for the Promotion of Industrial Education. Annual meeting, Atlanta, Ga., November 19-21.

International Independent Telephone Association. Annual convention, Chicago, Ill., December 1-3.

American Society of Mechanical Engineers. Annual meeting, New York city, December 1-4.

American Roentgen Ray Society. Annual meeting, New York city, December 28-30.

Chicago Electrical Show. Coliseum, Chicago, Ill., January 16-30, 1909.

American Association for the Advancement of Science. Annual meeting, Baltimore, Md., January, 1909.

Northwestern Electrical Association. Annual meeting, Milwaukee, Wis., January, 1909.

PERSONAL MENTION.

GENERAL C. EDWARD MURRAY, treasurer of the Crescent Insulated Wire and Cable Company, visited Chicago recently, calling upon his agents, the Metropolitan Electrical Supply Company.

MR. SHELLMAN B. BROWN, general manager of the Maryland Electric Railways Company (Baltimore & Annapolis Short Line), has resigned, after fifteen years' service as superintendent or general manager of the company.

MR. M. McINTYRE, of Detroit, Mich., has been made operating superintendent of the San Francisco, Vallejo & Napa Valley Railway Company, Napa, Cal. L. J. Perry, formerly general manager, will continue with the company as its business manager.

MR. E. M. HEDLEY, general superintendent of the Hudson Companies, will sever his connection with the McAdoo Tunnels on November 1. It is believed that he will become associated with the Interborough Rapid Transit Company, of New York City.

MR. ALBERT R. EASTMAN has been appointed general passenger agent of the Utica & Mohawk Valley Railway Company, the Oneida Railway Company and Syracuse Rapid Transit Railway Company. Mr. Eastman has for some time been the express agent of these roads and will continue in this capacity.

MR. B. A. BEHREND, for nearly ten years chief engineer of the Bullock Electric Manufacturing Company and for five years chief engineer of the electrical department of the Allis-Chalmers Company, the designer of the Bullock and Allis-Chalmers electrical machinery, has severed his connection with the Allis-Chalmers interests.

MR. BYRON CLINGERMAN, superintendent of the People's Light, Heat and Power Company, Springfield, Ohio, which has been consolidated with the Home Lighting, Power and Heating Company, also of Springfield, has resigned, and is succeeded by John Cook, superintendent of the Home Company, who will have charge of both plants.

MR. F. H. BETHELL, vice-president of the Bell Telephone Company of Pennsylvania and the Chesapeake & Potomac Telephone Company, who has been seriously ill for the past two months from typhoid fever, has left his summer home at Blue Ridge Summit, Pa., for Atlantic City, N. J. Mr. Bethell will, on or about November 1, leave for an extended European trip.

MR. H. P. JAMES, formerly electrical engineer of the Bryant Electric Company, now occupies the position of sales manager for the new line of push-button specialties recently placed on the market by the Cutler-Hammer Manufacturing Company of Milwaukee. Mr. James is a graduate of the Massachusetts Institute of Technology, where he received degrees in both electrical and mechanical engineering. Previous to his connection with the Bryant Electric Company, he was electrical inspector and engineer for the Associated Factory Mutual Fire Insurance Companies. In his present position with the Cutler-Hammer Manufacturing Company he will have opportunity to turn to practical account the result of his past experience in the inspection, testing and manufacture of electric lighting supplies.

OBITUARY NOTES.

MR. JONAS MEYERS, who was recently appointed superintendent of the Conshohocken Electric Light and Power Company, Conshohocken, Pa., was killed by a fall on October 16. Mr. Meyers was forty-three years of age.

DR. FREDERICK A. C. PERRINE, widely known as an authority on electrical subjects, died at his home on West Seventh street, Plainfield, N. J., October 20, following an illness of several months with Bright's disease. He was born at Freehold, N. J., in 1862 and was graduated from Princeton University, receiving the degree of Bachelor of Science. After devoting a short time to practical engineering he accepted the professorship of electrical engineering in Leland Stanford, Jr., University, which position he resigned to become president of the Stanley Electric Company at Pittsfield, Mass., doing some of the pioneer work in long-distance transmission. For the past few years he had been a consulting engineer, with offices in New York. Dr. Perrine was identified with several electrical organizations and was one of the most prominent members of the American Institute of Electrical Engineers, and he was the author of several technical works. He is survived by his wife, two daughters, Margaret and Anne Perrine, and one son, John. The funeral services were held at his late home on Thursday and the burial was at Freehold.

ELECTRICAL SECURITIES.

What it appeared at first would affect the American market very seriously, in the shape of an embroilment of the foreign powers, has lessened its appearance of disastrous consequence, and there are now assurances that for a time at least there will be no clash in the Balkan situation. The removal of the impending possibility of the dumping of American stocks by foreign holders and the strong condition of the banks here have been factors which have buoyed up the market, and with the end of the week prices began to creep upward, halting though the movement was in fact. When it is recalled that business is still far from normal, it comes as a surprise and should call for general gratification to note that railroads report that the gross earnings for the first week in October were only 3.9 per cent less than for the corresponding week in 1907.

Dividends have been declared upon the following electrical securities: Twin City Rapid Transit Company; regular quarterly dividend of 1¼ per cent on the common stock, payable November 14 to stockholders of record October 24. Milwaukee Railway and Light Company; regular quarterly dividend of 1½ per cent on the preferred stock, payable on October 31. United Electric Company; regular semi-annual dividend of 3½ per cent on the preferred stock, payable November 2. West Penn Railways Company; regular quarterly dividend of 1¼ per cent, payable November 2 to stock of record October 24. Michigan Telephone Company; regular quarterly dividends of 1½ per cent on the preferred stock and 1 per cent on the common stock, the preferred dividend payable February 1, 1909, and the common dividend payable December 1. Havana Electric Railway Company; regular quarterly dividend of $1.50 on the preferred stock, payable November 14 to stock of record October 24. Georgia Railway and Electric Company; regular quarterly dividend of 1¼ per cent on the preferred stock. American District Telegraph Company of New Jersey; regular quarterly dividend of 1 per cent.

ELECTRICAL SECURITIES FOR THE WEEK ENDED OCTOBER 17.

New York:	*Closing.*
Allis-Chalmers common	11⅝
Allis-Chalmers preferred	34¾
Brooklyn Rapid Transit	48½
Consolidated Gas	145
General Electric	143½
Interborough-Metropolitan common	10½
Interborough-Metropolitan preferred	31
Kings County Electric	125
Mackay Companies (Postal Telegraph and Cables) common	73¾
Mackay Companies (Postal Telegraph and Cables) preferred	67½
Manhattan Elevated	135
Metropolitan Street Railway	24
New York & New Jersey Telephone	114
Western Union	59½
Westinghouse Manufacturing Company	81¼

At the annual meeting of the Western Union Telegraph Company Paul Morton and Robert M. Gallaway were elected directors to succeed Morris K. Jesup and John D. Layng. The other directors were re-elected.

Boston:	*Closing.*
American Telephone and Telegraph	127
Edison Electric Illuminating	—
Massachusetts Electric	50½
New England Telephone	121½
Western Telephone and Telegraph preferred	75
Philadelphia:	*Closing.*
Electric Company of America	9⅞
Electric Storage Battery common	36
Electric Storage Battery preferred	36
Philadelphia Electric	10⅞
Philadelphia Rapid Transit	22
United Gas Improvement	87½
Chicago:	*Closing.*
Chicago Telephone	124
Commonwealth Edison	108½
Metropolitan Elevated preferred	40
National Carbon common	69
National Carbon preferred	110

TELEPHONE AND TELEGRAPH.

BOUND BROOK, N. J.—The council has granted a thirty-year franchise to the New York & New Jersey Telephone Company.

SALT LAKE CITY, UTAH—The management of the Utah Independent Telephone Company has accepted the new franchise ordinance passed by the council.

MONTGOMERY, ALA.—At a conference of leading officials of the Southern Bell Telephone Company, held in this city, plans were made for the extension of telephone lines into rural sections.

CROOKSTON, MINN.—The Tri-State Telegraph and Telephone Company has asked the city council of Crookston to grant it a franchise to use the streets and alleys and public places of the city for long-distance and toll service.

KNOXVILLE, TENN.—The East Tennessee Telephone Company on October 1 closed a deal connecting the East Tennessee wires with the Trotter exchanges, giving Trotter direct connection with all parts of the United States by long-distance telephone.

CARLISLE, PA.—The Bloserville Telephone Company has entered into an agreement with the American Union lines at Newville for a term of five years. The officers of the Bloserville Telephone Company are: President, George Barrick; secretary, William Calaman; treasurer, George Robert Fry.

CAMERON, S. C.—The Cameron Telephone Company has been organized with James M. Moss as president and Harvey L. Taylor as secretary and treasurer. All of the capital stock has been subscribed. An order has been placed for the equipment with the Western Electric Company. The following comprise the board of directors: James M. Moss, H. L. Taylor, F. I. Culler, J. J. Gee.

VERMILION, S. D.—The Northwestern Telephone Company has taken over the independent telephone line from Yankton to Elk Point, and from Elk Point out by way of Canton. It has also obtained a ninety-nine-year lease giving it connection with the local independent exchange at Yankton, and now controls all toll service out of Yankton.

HATTIESBURG, MISS.—The Home Telephone Company, of Hattiesburg, is negotiating for the construction of a long-distance line from this city to Seminary, with a view to ultimate extension on to Collins and then to Jackson, Miss. Later a line will be built south to Gulfport, thus giving the independent system control of the Gulf and Ship Island territory. Local systems at points along the line will be absorbed by the larger corporation.

BUTTE, MONT.—The Rocky Mountain Bell Telephone Company has started the construction of several new toll lines west from Butte to Deer Lodge and also to Anaconda. These new lines will furnish additional toll facilities for Anaconda, Deer Lodge, Missoula and the Coeur d'Alenes and Spokane. The construction of additional circuits east to Whitehall and Bozeman will also be started as soon as the necessary construction material is assembled.

NEW HAVEN, CT.—The returns of the Southern New England Telephone Company for the nine months since January 1, 1908, show that the additions to the stations in this state number 3,700. There is now a total of 64,000 stations in the state, the city of New Haven leading with a total of more than 10,000. The total number of exchanges in Connecticut is fifty-four. Since January two new telephone buildings have been opened, one in Danbury and one in Middletown, each with a common battery service.

DES MOINES, IOWA—The Farmers & Merchants' Telephone Company, of Marshalltown, with a capital stock of $250,000, has been granted a charter by the secretary of state. The company is made up of the officers and stockholders of the mutual telephone companies of central Iowa and the plan is to incorporate into one company the lines in Calhoun, Dallas, Hamilton, Story, Greene and other central Iowa counties. The stock issue will be 2,000 shares of preferred stock at $50 a share par value, and 3,000 shares of common stock at $50 a share par value. The new company will include the Mutual exchange in Des Moines, Clyde E. Brenton, of Dallas county, president of the Des Moines concern, being one of the officers of the merger. The organization of the new company means also that the working agreements which have been carried on between the different mutual concerns will be annulled and a new agreement entered into to connect the city and the central section of the state with other portions of Iowa.

NEW INCORPORATIONS.

SACRAMENTO, CAL.—Live Oak & Encinal Light and Power Company. $20,000.

LOS ANGELES, CAL.—Home Gas and Electric Company, Newport Beach. $50,000.

AUSTIN, TEX.—Howe Telephone Company, of Grayson County. $2,500. Incorporators: C. A. Shock, S. D. Donohue, R. S. Daugherty.

PETALUMA, CAL.—Mount Jackson Water and Power Company. $20,000. Incorporators: Thomas C. Mellersh, G. P. Hall and Thomas Mellersh.

TRENTON, N. J.—Middlesex Telephone Company, Monmouth Junction. $10,000. Incorporators: Clarence S. Grover, D. C. Mershon and Andrew Ely.

PORTLAND, ME.—Cairo Railway and Light Company, Portland. To manufacture and sell gas and electricity. $1,000,000. President, G. F. Duncan; treasurer and clerk, Edward Woodman, both of Portland.

MONTPELIER, VT.—Groton Telephone Company. $10,000. Organized for the purpose of maintaining telephone lines in the towns of Groton, Bradford, Topsham, Barnet, Corinth, Newbury, Peacham and Ryegate.

STOCKTON, CAL.—San Joaquin Valley Electric Railway Company, Modesto. $1,000,000. Incorporators: Morris L. Brackett, H. E. Teter, John G. Weir, E. T. Zook and G. E. Weaver. To build and maintain an electric railroad from Stockton to Modesto, a distance of thirty-five miles.

OMAHA, NEB.—Omaha & Southeastern Railway Company. To operate between Omaha and Lincoln. $100,000. Incorporators: Ellery S. McNaul, Dever Sholes, Charles L. Dundey, Nicholas D. Doune, L. Howard Brumbaugh, I. G. Ladd, F. H. Rile, G. E. Moffat and Stephen St. John Malven.

NEW MANUFACTURING COMPANIES.

HARRISBURG, PA.—The Fairmount Electric and Manufacturing Company has been incorporated with a capital of $50,000, with Chester S. Leonard, of Philadelphia, as president.

BOSTON, MASS.—The Moving Sign Company has been incorporated to do an electrical sign business. The capital stock is $50,000, and the officers are: C. B. Battey, president; T. S. McGowne, treasurer, Boston.

ALBANY, N. Y.—The Phone-Hear-Plain Company, of New York, has been incorporated with a capital of $100,000. The directors are Berthold Levi, Henry Raphael and Doun Wood, all of New York city.

CHICAGO, ILL.—The Delta-Star Electric Company has been incorporated with a capital of $1,500 to manufacture and deal in electrical goods and appliances. The incorporators are: Garret V. Weart, James G. Weart and James A. Obermiller.

INDUSTRIAL ITEMS.

THE WESTERN ELECTRIC COMPANY, Chicago, Ill., has published an attractive bulletin, No. 5910-8, devoted to electrical equipment for mines.

THE OHIO BRASS COMPANY, Mansfield, Ohio, in the October issue of its bulletin, devotes considerable space to special information on car equipments.

THE NEBRASKA ELECTRIC COMPANY, Lincoln, Neb., announces that the personnel of the company has undergone a change and will hereafter be officered as follows: President, Paul W. Horbach; vice-president and treasurer, Albert G. Munro; secretary, Carl C. Wilson.

THE STUART-HOWLAND COMPANY has leased the adjoining buildings, Nos. 1, 2 and 3 Winthrop square and 12 to 36 Otis street, and has moved its Boston store and office to that address. This gives the company greatly increased space and as there is about 13,000 feet on each floor, with over 325 feet of street frontage, it is unusually light and admirably suitable for the purpose, and the large floor areas will enable it to handle goods with greater economy. Large expense has been gone to in fitting up for each

department and the facilities, it is assured, are now unsurpassed. The company has recently acquired several valuable agencies, has largely increased its stock and reports business recently considerably in advance of last year.

THE PITTSBURGH TRANSFORMER COMPANY, Pittsburg, Pa., announces that Judge Archbold, sitting in the United States Circuit Court for the Western District of Pennsylvania, at Scranton, on October 2, handed down a decision holding in effect that infringement was not shown and denying the complainant's motion for preliminary injunction in the suit of the Westinghouse Electric and Manufacturing Company for infringement of the so-called "Stanley Patent No. 469,809," against the Pittsburgh Transformer Company.

THE MASSACHUSETTS CHEMICAL COMPANY announces that it has moved its New York office from 237 Broadway to the Hudson Terminal Building, 30 Church street. A. G. Cozzens is sales agent, as formerly. At the new address the well-known line of electrical tapes, insulating fabrics and compounds and molded rubber goods will be carried to fill emergency orders. The former telephone number, 3440 Cortlandt, is retained. The offices are on the third floor, just at the bridge connecting the two halves of the building.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., in bulletin No. 4621, illustrates and describes its luminous arc lamp for multiple circuits. The Form 2 lamp is intended principally for use in foundries, machine shops, freight houses, etc., where a large unit is desired, and combines high efficiency with low maintenance cost. The lamp is made for 110 and 220-volt direct-current circuits, the 110-volt being suitable for any line voltage from 100 to 125 and the 220-volt lamp for voltages from 200 to 250. The company has also designed a multiple luminous lamp for use on direct-current power circuits and also for use as a headlight on interurban cars and mining locomotives. The bulletin illustrates and fully describes all of these lamps.

THE CENTRAL ELECTRIC COMPANY, Chicago, Ill., is distributing circulars descriptive of its flexible steel conduit and conductors. It is claimed that this conduit is absolutely flexible and can be installed at much less expense than can a rigid pipe system. The circular also contains illustrations of the Armour stripping tools and their application. Copies will be mailed to those interested. The company is also distributing circulars describing "Galvaduct" interior conduit, calling attention to the various structural details. Complete data are also given on the diameter, threads per inch, weights and prices. By means of a chart a graphic representation is given of the comparative sizes of double-braided wires and "Galvaduct" conduit. Copies of this circular will be mailed upon request.

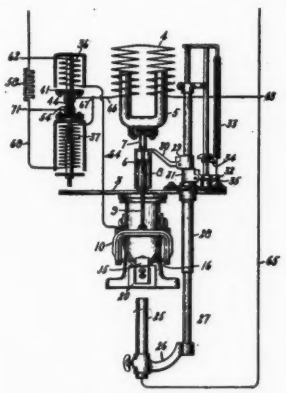
Record of Electrical Patents.

Week of October 23.

900,693. CIRCUIT-BREAKER. Charles C. Badeau, Schenectady, N. Y., assignor to General Electric Company. Filed September 16, 1901. Interoperating toggles are connected in tandem to multiply the force exerted on the movable contact.

900,699. CIRCUIT-CONTROLLER. Alexander Bevan, Providence, R. I. Filed September 16, 1907. Means are provided for absorbing the excess momentum of the circuit-closing lever.

900,708. HIGH-TENSION CIRCUIT-BREAKER. Fred B. Corey, Schenectady, N. Y., assignor to General Electric Company. Filed February 19, 1903. Connected plates of magnetic material are disposed on opposite sides of the contacts.



900,718.—ARC LAMP.

900,718. ARC LAMP. Richard Fleming and Cromwell A. B. Halvorson, Jr., Lynn, Mass., assignors to General Electric Company. Filed May 1, 1905. The movable armature enters the series coil, and the electrode is actuated by differential coils.

900,719. ADJUSTABLE SUPPORT FOR VAPOR LAMPS. Stanwood E. Flitchner, Englewood, N. J., assignor to Cooper Hewitt Electric Company, New York, N. Y. Original application filed July 28, 1904. A combination of a tilting frame and vapor electric lamp.

900,732. ELECTRICALLY HEATED CURLING IRON. Harry Hertzberg and Maurice J. Wohl, New York, N. Y., assignors to Economy Electric Company, Brooklyn, N. Y. Filed April 18, 1907. One of a pair of co-operating members is tubular and contains a resistance therein.

900,733. ELECTRIC LIGHTING. Peter C. Hewitt, New York, N. Y., assignor, by mesne assignments, to Cooper Hewitt Electric Company, New York. Filed April 5, 1900. A combination of tubes, one of which yields a light containing rays which the light from the other tube is deficient in.

900,743. RELAY. Isidor Kitsee, Philadelphia, Pa. Filed October 19, 1907. Means are provided to bring the relaying contacts together independent of the incoming impulses.

900,745. SYSTEM OF ELECTRICAL DISTRIBUTION. Osias O. Kruh, Schenectady, N. Y., assignor to General Electric Company. Filed September 15, 1905. A plurality of rectifiers is engaged in combination with a plurality of energy-storing devices in series across the alternating-current leads.

900,771. ARMATURE FOR UNIPOLAR MACHINES. Jakob E. Noeggerath, Schenectady, N. Y., assignor to General Electric Company. Filed April 25, 1907. The armature has two sets of collector rings and armature conductors between said sets of rings.

900,773. ELECTRIC PLUG RECEPTACLE. George L. Patterson, New York, N. Y., assignor to Alice C. Patterson, New York, N. Y. Filed October 8, 1907. The receptacle has a horizontally hinged closure.

900,777. PREPAYMENT METER. William H. Pratt, Lynn, Mass., assignor to General Electric Company. Filed April 10, 1905. The movable coin chute is held in one position when empty and in another when one or more coins are contained therein.

900,780. DYNAMOELECTRIC MACHINE. Henry G. Reist, Schenectady, N. Y., assignor to General Electric Company. Filed June 20, 1904. In combination with the field poles and windings thereon there is a support for the winding of each pole comprising a portion encircling the pole.

900,781. DYNAMOELECTRIC MACHINE. Henry G. Reist, Schenectady, N. Y., assignor to General Electric Company. Filed March 1, 1905. The collector rings are provided with a cylindrical external contact surface and with a cylindrical internal contact surface.

900,786. TWO-BUTTON SWITCH. Frank W. Sanford, Schenectady, N. Y., assignor to General Electric Company. Filed October 2, 1905. An escape plate is rigidly connected with the contact blade.

900,793. ARC LAMP. George E. Stevens, Lynn, Mass., assignor to General Electric Company. Filed September 27, 1906. The frame is composed of a backbone made of a rod bent into the form of a yoke, having depending legs.

900,830. APPARATUS FOR NEUTRALIZING STATIC ELECTRICITY. William H. Chapman, Portland, Me. Filed January 23, 1908. An electrically charged insulated conductor with small radiating surfaces is secured within a hollow conductor which is connected to earth.

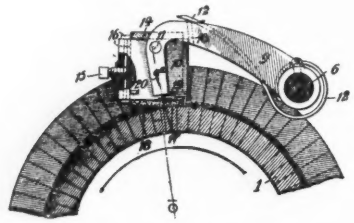
900,854. MEANS FOR LOCKING ELECTRIC SOCKETS TO FIXTURES. Harvey Hubbell, Bridgeport, Ct. Filed March 16, 1907. A coupling device is permanently connected to the socket shell.

900,884. AUTOMATICALLY ADJUSTABLE BRUSH-HOLDER. Walter J. Richards, Milwaukee, Wis., assignor to Allis-Chalmers Company. Filed September 10, 1900. A pivoted brush-holder is arranged with two separate contacting surfaces. The brush is automatically adjustable according to the direction of rotation.

900,898. ELECTRIC ACCUMULATOR. Molière C. Thiellet and Marius J. Denard, Lyon, France. Filed April 3, 1907. An electrode comprising, in combination with the oxide of lead, gelatine gelatinized in aqueous bichromate of potash, and asbestos fibre emulsified in sulphuric acid and silicate of soda.

900,909. ELECTRIC GLOW LAMP, ETC. Fritz Blau and Hermann Remané, Berlin, Germany, assignors to Deutsche Gasglühlicht Aktiengesellschaft (Auergesellschaft), Berlin, Germany. Filed April 25, 1906. A deposit of a metal is provided in the bulb before exhausting the bulb.

900,926. ELECTROLYTIC APPARATUS FOR PURIFYING LIQUIDS. John T. Harris, New York, N. Y. Continuation of application filed June 20, 1903. A magnetized anode of a material which will yield a coagulant, a cathode, and means for separating the impurities from the treated liquid.



900,884.—AUTOMATICALLY ADJUSTABLE BRUSH-HOLDER.

900,929. PILE PROTECTOR. William Howe, Seattle, Wash. Filed January 28, 1907. An electrode is slidably mounted on the pile and means provided whereby the electrode may be substantially insulated from the surrounding water when submerged.

900,961. PRODUCTION OF MAGNESIUM BY ELECTROLYSIS. George O. Seward and Franz von Kügelgen, Holcombs Rock, Va., assignors to Virginia Laboratory Company, New York, N. Y. Filed October 10, 1905. Magnesium fluoride and calcium chloride are fused together with flux of an alkali fluoride. The bath is rendered anhydrous and then electrolyzed to produce magnesium.

900,962. PRODUCTION OF BARIUM AND BARIUM ALLOYS. George O. Seward and Franz von Kügelgen, Holcombs Rock, Va., assignors to Virginia Laboratory Company, New York, N. Y. Filed March 28, 1906. Fused barium chloride is electrolyzed with the addition of a barium salt of a lower melting point.

900,977. DYNAMOELECTRIC MACHINE. Bernard A. Behrend, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Filed March 26, 1906. The stationary laminated core has circumferential ventilating passageways, and cooling air currents are forced through a hollow frame surrounding said core.

901,013. GALVANOMETER. Louie E. Knott, Boston, Mass., assignor to L. E. Knott Apparatus Company, Boston, Mass. Filed November 24, 1906. A vertically arranged magnet is permanently connected to the base, and a backing plate is detachably secured to the magnet.

901,027. SAFETY GUARD FOR TROLLEY WHEELS. Frank J. Nolan, Buffalo, N. Y., assignor to the Automatic Trolley Guard Company, Buffalo, N. Y. Filed September 13, 1907. Means are provided for supporting the trolley wire in the opening intervening between the two wings of the trolley guard.

901,033. ELECTRIC BELL. George L. Patterson, New York, N. Y., assignor to Alice C. Patterson, New York, N. Y. Filed September 28, 1907. A self-contained wall bell.

901,050. ELECTRIC CLOCK. Charles H. White, Sparrows Point, Md. Filed April 24, 1907. The minute arbor is provided with a tight ratchet wheel and a rocker which is loose on the arbor, having an extended weighted arm and carrying a pawl which engages with the teeth of the ratchet wheel, together with a shank, bearing and armature.

901,108. MUFFLER FOR TELEPHONE TRANSMITTERS. George Kracker, Philadelphia, Pa. Filed December 28, 1907. Sound-deadening material is placed in the mouthpiece and casing.

901,122. SYSTEM OF ELECTRICALLY CONTROLLED SIGNALS FOR RAILWAYS. Jean Paul and Théophile Ducousso, Paris, France. Filed April 13, 1907. Two similar parts are pivotally mounted in a transparent casing and actuated by an energized electromagnet.

901,171. ELECTRIC BURGLAR ALARM. Simon B. Hess, New York, N. Y. Filed May 27, 1907. Multiple alarm signal systems are in shunt with each other.

901,189. MOTOR-CONTROLLING APPARATUS. Michael C. Regan, U. S. Army. Filed February 4, 1908. A step-by-step resistance-inserting mechanism.

901,207. LIGHTNING ARRESTER. Jacob B. Struble, Wilkinsburg, Pa. Filed December 10, 1906. A lightning arrester having in combination means for forming a spark-gap, and means for dampening an arc.

901,212. TELEPHONE HOOK SWITCH. Henry Tideman, Menominee, Mich. Filed July 6, 1907. Locking means are provided for the adjusting screw.

901,213. TELEPHONE HOOK SWITCH. Henry Tideman, Menominee, Mich. Filed July 6, 1907. The tension spring is supported and retained by the locknut.

901,214. TELEPHONE HOOK SWITCH. Henry Tideman, Menominee, Mich. Filed July 6, 1907. The tension spring is adapted to engage and actuate the hook lever.

901,215. TELEPHONE RINGER. Henry Tideman, Menominee, Mich. Filed July 6, 1907. The cores of the electromagnets are drilled and threaded internally at the armature end.

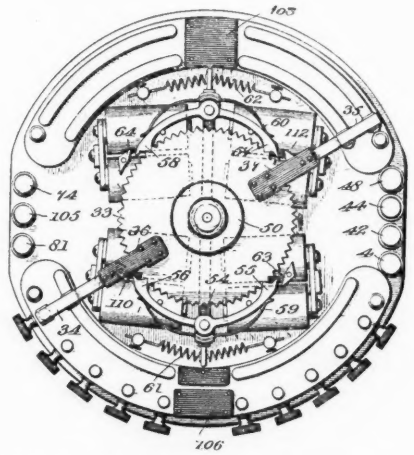
901,216. TELEPHONE RINGER. Henry Tideman, Menominee, Mich. Filed July 6, 1907. The cores and helices of the ringer are mounted within the magnet frame.

901,250. CAB SIGNAL SYSTEM. Daniel J. McCarthy, Wilkinsburg, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Filed May 19, 1908. An indicator is carried by the vehicle and arranged to have a circuit induced therein by current flowing in the track circuit.

901,261. SAFETY FUSE. Frank D. Reynolds and Joseph Sachs, Hartford, Ct., assignors to the Sachs Company, Hartford, Ct. Filed April 17, 1906. The fuse strip has a rupture portion and adjacent portions of substantially the same cross-section as, and of greater heat-radiating surface than, the said rupture portion.

901,269. TELEPHONE RINGER. Henry Tideman, Menominee, Mich. Filed July 6, 1907. The helices and armature are mounted entirely within the U-shaped permanent magnet.

901,280. ELECTROPLATING APPARATUS. John T. Daniels, Newark, N. J., assignor of one-half to the Hanson & Van Winkle Company, Newark, N. J. Filed May 11, 1908. A permeable container is suspended in the stationary tank, and is rotatable on an axis at an angle to the level of the surface of the solution.



901,189.—MOTOR-CONTROLLING APPARATUS.

901,294. APPARATUS FOR ELECTRIC LIGHTING. Peter C. Hewitt, New York, N. Y., assignor, by mesne assignments, to Cooper Hewitt Electric Company, New York. Original application filed April 5, 1900. An incandescent lamp is connected in series with a U-shaped fibre tube.

901,299. METHOD OF PRODUCING ELECTRIC COILS AND CONDUCTORS THEREFOR. Isidor Kitsee, Philadelphia, Pa. Original application filed February 11, 1907. Means are provided for slitting a sheet of conducting material to divide the same into a plurality of strips, and then insulating the strips to adapt same as independent windings.

901,306. SYSTEM OF ELECTRIC DISTRIBUTION. Percy H. Thomas, Pittsburg, Pa., assignor to Cooper Hewitt Electric Company, New York. Filed January 21, 1903. Means are provided for effecting a continuous flow of current in a given direction through a series of vapor rectifiers.